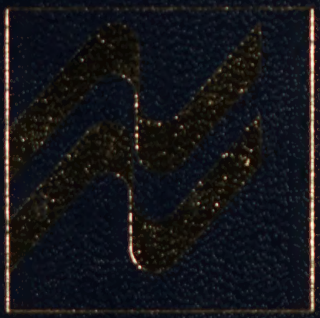
PRODUCT REFERENCE

HAMILTON/AVNET ELECTRONICS AND NATIONAL SEMICONDUCTOR



National Semiconductor

EDGE INDEX

PRODUCT REFERENCE NOVEMBER 1979

Data Acquisition 1

Digital 2

Discrete 3

Hybrids 4

Linear 5

Memory 6

Memory Components 7

Microcomputer 8

Microprocessor 9

MOS/LSI 10

Optoelectronics 11

Transducers 12

Miscellaneous 13

) 1979 National Semiconductor Corp.

CC/CP90M119/Printed in U.S.A.

DATA ACQUISITION CIRCUITS CROSS REFERENCE (Continued)

Part No.	Function	National Direct Replacement	National Functional Replacement
ANALOG DEVICES (Continued)			
AD7501KD			LF11508D
AD7501SD			LF11508D
AD7502JD	Dual 4-Channel Analog Multiplexer		LF11509D
AD7502JN			LF13509D
AD7502KD			LF11509D
AD7502KN			LF13509D
AD7502SD			LF11509D
AD7510DIJD	4-Independent SPST Analog		LF11331D
AD7510DIJN	Switches		LF13331N
AD7510DIKD			LF11331D
AD7510DIKN			LF13331N
AD7510DISD			LF11331D
AD7516JN	Quad SPST Analog Switch		CD4066BCN
AD7516KN			CD4066BCN
AD7516SD			CD4066BMJ
AD7516TD			CD4066BMJ
AD7520JD	10-Bit Multiplying D/A Converters	DAC1022LCD	
AD7520JN		DAC1022LCN	
AD7520KD		DAC1021LCD	
AD7520KN		DAC1021LCN	
AD7520LD		DAC1020LCD	
AD7520LN		DAC1020LCN	
AD7520SD		DAC1022LD	

Part No.	Function	National Direct Replacement	National Functional Replacement
ANALOG DEVICES (Continued)			
AD7531JN		DAC1222LCN	
AD7531KD		DAC1221LCD	
AD7531KN		DAC1221LCN	
AD7531LD		DAC1220LCD	
AD7531LN		DAC1220LCN	
AD7533AD	10-Bit Multiplying D/A Converter	DAC1022LCD	
AD7533BD	Low Cost	DAC1021LCD	
AD7533CD		DAC1020LCD	
AD7533JN		DAC1022LCN	
AD7533KN		DAC1021LCN	
AD7533LN		DAC1020LCN	
AD7533SD		DAC1022LD	
AD7533TD		DAC1021LD	
AD7533UD		DAC1020LD	
AD7541AD	12-Bit Multiplying D/A Converter	*DAC1218LCD	
AD7541BD		*DAC1219LCD	
AD7541JN		*DAC1218LCD	
AD7541KN		*DAC1219LCD	
AD7541SD		*DAC1218LD	
AD7541TD	12-Bit Multiplying D/A Converter	*DAC1219LD	
AD7550BD	13-Bit A/D Converter		ADC1305LCD
AD7570JD	10-Bit A/D Converter		ADC1003LCD
AD7570LD			ADC1001LCD

AD7520UD		DAC1020LD	
AD7521JD	12-Bit Multiplying D/A Converter	DAC1222LCD	
AD7521JN		DAC1222LCN	
AD7521KD		DAC1221LCD	
AD7521KN		DAC1222LCN	
AD7521LD		DAC1220LCD	
AD7521LN		DAC1220LCN	
AD7521SD		DAC1222LD	
AD7521TD		DAC1221LD	
AD7521UD		DAC1221LD	
AD7522JD	10-Bit Buffered Multiplying D/A		DAC1008LCD
AD7522JN	Converter		DAC1008LCN
AD7522KD			DAC1007LCD
AD7522KN			DAC1007LCN
AD7522LD			DAC1006LCD
AD7522LN			DAC1006LCN
AD7522SD			DAC1008LD
AD7522TD			DAC1007LD
AD7522UD			DAC1006LD
AD7523JN	8-Bit Multiplying D/A Converter,		DAC0808LCN
AD7523KN	CMOS		DAC0808LCN
AD7523LN		DAC0808LCN	
AD7530JD	10-Bit Multiplying D/A Converter,	DAC1022LCD	
AD7530JN	CMOS	DAC1022LCN	
AD7530KD		DAC1021LCD	
AD7530KN		DAC1021LCN	
AD7530LD		DAC1020LCD	
AD7530LN		DAC1020LCN	
AD7531JD	12-Bit Multiplying D/A Converter	DAC1222LCD	

ADC80AG-10	10-Bit A/D, Low Cost		ADC1210HCD
ADC80AG-12	12-Bit A/D, Low Cost		ADC1210HCD
ADC80AGZ-10	10-Bit A/D, Low Cost		ADC1210HCD
ADC80AGZ-12	12-Bit A/D, Low Cost		ADC1210HCD
ADC82AG	8-Bit A/D, Low Cost, High Speed		ADC0804LCN
ADC82AM			ADC0804LCN
ADC85C-10	10-Bit A/D, Low Drift,		*ADC1001LCD
ADC85-10	High Speed		*ADC1001LCD
ADC85C-12	12-Bit A/D, Low Drift,		*ADC1201LCD
ADC85-12	High Speed		*ADC1201LCD
DAC80-CBI-1	12-Bit D/A, Low Cost		DAC1280HCD
DAC80-CBI-V			DAC1280HCD
DAC80-CCD-1	3-Digit D/A, Low Cost		DAC1287HCD
DAC80-CCD-V			DAC1287HCD
DAC82KG	8-Bit D/A, Low Cost		DAC0800LCD
DAC82BM			DAC0800LCD
DAC82SM			DAC0800LD
DAC85-CBI-1	12-Bit D/A, Low Drift	DAC1285HCD	
DAC85-CBI-V		DAC1285HCD	
DAC85-CCD-I		DAC1286HCD	
DAC85-CCD-V		DAC1286HCD	
DAC85LD-CBI-I		DAC1285HCD	*ADC1001LCD
DAC85LD-CBI-V		DAC1285HCD	
DAC90-BG	8-Bit D/A, Monolithic		DAC0800LCD
DAC90-SG			DAC0800LD
MP20	8080-SC/MP-Compatible 8-Bit A/D		ADC0816CCN
MP21	6800-, 6502-Compatible 8-Bit A/D		ADC0816CCN
MP22BG	Universal μP-Compatible 12-Bit A/D		*ADC1305LCD

DATA ACQUISITION CIRCUITS CROSS REFERENCE (Continued)

Part No.	Function	National Direct Replacement	National Functional Replacement
BURR-BROWN (Continued)			
MP10	8-Bit D/A μP-Compatible 8080-, S.C.		DAC1003LCD
MP11	8-Bit D/A μP-Compatible 6800-, 6502		DAC1003LCD
MPC8S	8-Channel MUX, CMOS		LF13508D
MPC4D	4-Channel Diff, MUX, CMOS		LF13508D
SDM856JG	12-Bit A/D, 16 S.E., 8 Diff Data		ADS1216HC
SDM856KG	Acquisition System		ADS1216HC
SDM857JG	Same as Above, Low Level		ADS1216HC
SDM857KG			ADS1216HC
SHC80KP	S/H, Low Cost Complete		ADS1216HC
SHC80BM			ADS1216HC
SHC85	S/H, High Speed Complete		ADS1216HC
SHC273AM	S/H, Low Cost Monolithic	LF398H	
VFC32KP	V/F, Low Cost Monolithic		LM331H
VFC32BM			LM331H
VFC32SM			LM131H
VFC42BP	Low Cost, Complete Hybrid		LM331AH
VFC52BP			LM331AH
MOTOROLA			
MC1405L	A/D Converter Subsystem		LF13300D
MC1408L6	8-Bit Multiplying D/A Converter	DAC0806LCJ	

Part No.	Function	National Direct Replacement	National Functional Replacement
PMI (Continued)			
DAC-100AC			DAC1022LD
DAC-100BB			DAC1020LCD
DAC-100BC			DAC1021LCD
DAC-100CC			DAC1022LCD
DAC-100DD			DAC1022LCD
SSS562-SD-BIN	12-Bit Multiplying D/A Converter		DAC1200HCD
SSS562-SD-BCD			DAC1200HCD
SSS562-AD-BIN			DAC1200HCD
SSS562-AD-BCD			DAC1200HCD
SSS562-KD-BIN			DAC1200HCD
SSS562-KD-BCD			DAC1200HCD
SSS1508A-8Q	8-Bit Multiplying D/A Converter	DAC0808LD	
SSS1408A-8Q		DAC0808LCD	
SSS1408A-7Q		DAC0807LCD	
SSS1408A-6Q		DAC0806LCD	
MUX-88AQ	Protected 8-Channel BI-FET		LF11508D
MUX-88BQ	Analog Multiplexer		LF11508D
MUX-88EQ			LF13508D
MUX-88FQ			LF13509D
REF-01AJ	+10V Precision Voltage Reference		LH0070H
REF-01J			LH0070H
REF-01EJ			LH0070CH
REF-01HJ			LH0070CH

MC1408L7		DAC0807LCJ	
MC1408L8		DAC0808LCJ	
MC1408P6		DAC0806LCN	
MC1408P7		DAC0807LCN	
MC1408P8		DAC0808LCN	
MC1508L8		DAC0808LD	
MC3408L	8-Bit Multiplying D/A Converter	DAC0806LCJ	
MC3410L	10-Bit Multiplying D/A Converter		DAC1020LCD
MC3410P			DAC1020LCN
MC3410CL			DAC1021LCD
MC3410CP			DAC1021LCN
MC3510L			DAC1020LD

PMI

DAC-03ADXI(X2)	8- and 10-Bit Low Cost D/A		DAC1020LCD
DAC-03BDXI(X2)	Converter		DAC1021LCD
DAC-03CDXI(X2)			DAC1022LCD
DAC-03DDXI(X2)			DAC1022LCD
DAC-08AQ	8-Bit High Speed Multiplying	DAC0802LD	
DAC-08Q	D/A Converter	DAC0800LJ	
DAC-08HQ		DAC0802LCJ	
DAC-08EQ		DAC0800LCJ	
DAC-08CQ		DAC0801LCJ	
DAC-100AA	8- and 10-Bit D/A Converter		DAC1020LD
DAC-100AB	w/Reference		DAC1021LD

REF-01CJ			LH0070CH
REF-01DJ			LH0070CH
REF-02AJ	+5V Precision Voltages		LM136H
REF-02J	Reference/Thermometer		LM136H
REF-02EJ			LM336H
REF-02HJ			LM336H
REF-02CJ			LM336H
REF-02DJ			LM336H

TEXAS INSTRUMENTS

TL501J	3-1/2 Digit A/D Processor (0.1)		ADC3511CCN
TL501N			ADC3511CCD
TL505J	3-Digit A/D Converter		ADC3511CCD
TL505N			ADC3511CCN
TL487N	5-Step Analog Level Detector		LM3915N
TL489N	5-Step Analog Level Detector		LM3914N
TL490N	10-Step Linear Scale Indicator O.C.		LM3914N
TL491N	10-Step Linear Scale Indicator (E.P.U.)		LM3914N
TL507P	7-Bit A/D Converter		ADC0804LCN
ADC0816J			ADC0816LD
ADC0816CJ			ADC0816CCD
ADC0816CN			ADC0816CCN
ADC0817CJ			ADC0817CCJ
ADC0817CN			ADC0817CCN

* To be announced.

A/D CONVERTER/DVM SELECTION GUIDE

Part No	Resolution (Bits)	Absolute Accuracy (Max)	Conversion Time (Typ)	Input Voltage Range	Output Logic Levels	Supplies (V)	Temperature Range (Note 1)			Package	Comments
							M	I	C		
A/D CONVERTER											
ADC0800	8	± 2 LSB	100 μs	10V	TTL, TRI-STATE*	+5, −12	•	•	•	18-Pin DIP	
ADC0801	8	± 1/4 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	20-Pin DIP	Differential Input
ADC0802	8	± 1/2 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	20-Pin DIP	Differential Input
ADC0803	8	± 1/2 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	20-Pin DIP	Differential Input
ADC0804	8	± 1 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	20-Pin DIP	Differential Input
ADC0808	8	± 1/2 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	28-Pin DIP	Includes 8-Channel MUX
ADC0809	8	± 1 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	28-Pin DIP	Includes 8-Channel MUX
ADC0816	8	± 1/2 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	40-Pin DIP	Includes 16-Channel MUX
ADC0817	8	± 1 LSB	100 μs	5V	TTL, TRI-STATE	+5	•	•	•	40-Pin DIP	Includes 16-Channel MUX
ADB1200	12	± 1/2 LSB	36 ms	±11V	TTL, TRI-STATE	+5, −15			•	28-Pin DIP	Dual Slope
LF13300						±15			•	18-Pin DIP	
ADC1210	12	± 1/2 LSB	100 μs	10.2V	CMOS	+5 to ±15	•	•		24-Pin DIP	10-Bit Conversion in 30 μs
ADC1211	12(10)	± 1 LSB	100 μs	10.2V	CMOS	+5 to ±15	•	•		24-Pin DIP	
ADC3511	3-1/2 Digit	.05%	200 ms	2V	TTL, TRI-STATE	+5			•	24-Pin DIP	Integrating μP Compatible
ADC3711	3-3/4 Digit	.05%	400 ms	2V	TTL, TRI-STATE	+5			•	24-Pin DIP	Integrating μP Compatible
LM131	V-F	.01%	N/A	V_{CC}-2V	N/A	+5 to +40	•	•	•	8-Pin DIP or TO-99 CAN	Voltage-to-Frequency Converter 100 kHz max
DIGITAL VOLTMETER											
ADD3501	3-1/2 Digit	.05%	200 ms	V_{CC}-2V	7-Seg. LED Drive	+5			•	28-Pin DIP	3-1/2 Digit LED DPM
ADD3701	3-3/4 Digit	.05%	400 ms	V_{CC}-2V	7-Seg. LED Drive	+5			•	28-Pin DIP	3-3/4 Digit LED DPM

Note 1: Temperature ranges are: M = −55°C to +125°C ambient; I = −40°C to +85°C or −25°C to +85°C; C = 0°C to 70°C.

D/A CONVERTER SELECTION GUIDE

Part No.	Resolution (Bits)	Linearity @ 25°C (Max)	Internal Reference	Output Op Amp	Setting Time (± 12 LSB)	Supplies (V)	Temperature Range (Note 1)			Package	Comments
							M	I	C		
DAC0800	8	.19			135 ns	± 5 to ± 15	•		•	16-Pin DIP	High-Speed Multiplying
DAC0801	8	.39			150 ns	± 5 to ± 15	•		•	16-Pin DIP	High-Speed Multiplying
DAC0802	8	.1			135 ns	± 5 to ± 15	•		•	16-Pin DIP	High-Speed Multiplying
DAC0806	8	.78			150 typ	± 5 to ± 15			•	16-Pin DIP	Multiplying
DAC0807	8	.39			150 typ	± 5 to ± 15			•	16-Pin DIP	Multiplying
DAC0808	8	.19			150 typ	± 5 to ± 15	•		•	16-Pin DIP	Multiplying
DAC1000	10	.05			500 ns typ	5 to 15	•		•	24-Pin DIP	µP Compatible Double Buffered
DAC1001	10	.1			500 ns typ	5 to 15			•	24-Pin DIP	µP Compatible Double Buffered
DAC1002	10	.2			500 ns typ	5 to 15			•	24-Pin DIP	µP Compatible Double Buffered
DAC1006	10	.05			500 ns typ	5 to 15	•		•	20-Pin DIP	µP Compatible Double Buffered
DAC1007	10	.1			500 ns typ	5 to 15			•	20-Pin DIP	µP Compatible Double Buffered
DAC1008	10	.2			500 ns typ	5 to 15			•	20-Pin DIP	µP Compatible Double Buffered
DAC1020	10	.05			500 ns typ	5 to 15	•		•	16-Pin DIP	4-Quadrant Multiplying
DAC1021	10	.1			500 ns typ	5 to 15	•		•	16-Pin DIP	4-Quadrant Multiplying
DAC1022	10	.2			500 ns typ	5 to 15	•		•	16-Pin DIP	4-Quadrant Multiplying
DAC1200	12	.012	•	•	1.5-2.5 µs	± 15, 5	•	•		24-Pin DIP	Current or Voltage Mode
DAC1201	12	.049	•	•	1.5-2.5 µs	± 15, 5	•	•		24-Pin DIP	Current or Voltage Mode
DAC1202	3 Digit	.01	•	•	1.5-2.5 µs	± 15, 5	•	•		24-Pin DIP	BCD Current or Voltage Mode
DAC1203	3 Digit	.05	•	•	1.5-2.5 µs	± 15, 5	•	•		24-Pin DIP	BCD Current or Voltage Mode
DAC1220	12	.05			500 ns typ	5 to 15	•		•	18-Pin DIP	4-Quadrant Multiplying
DAC1221	12	.1			500 ns typ	5 to 15	•		•	18-Pin DIP	4-Quadrant Multiplying
DAC1222	12	.2			500 ns typ	5 to 15	•		•	18-Pin DIP	4-Quadrant Multiplying
DAC1280	12	.024	•	•	300 ns/2.5 µs	± 15, 5	•		•	24-Pin DIP	Current or Voltage Mode

D/A CONVERTER SELECTION GUIDE (Continued)

Part No.	Resolution (Bits)	Linearity @ 25°C (Max)	Internal Reference	Output Op Amp	Setting Time (±12 LSB)	Supplies (V)	Temperature Range (Note 1)			Package	Comments
							M	I	C		
DAC1285	12	.012	•	•	300 ns/2.5 μs	±15, 5	•		•	24-Pin DIP	Current or Voltage Mode
DAC1286	12	.05	•	•	300 ns/2.5 μs	±15, 5	•		•	24-Pin DIP	BCD Current or Voltage Mode
DAC1287	12	.1	•	•	300 ns/2.5 μs	±15, 5	•		•	24-Pin DIP	BCD Current or Voltage Mode

Note 1: Ambient temperature range for "M" is −55°C to +125°C, "I" is −25°C to +85°C, "C" is 0°C to +70°C.

TTL STATUS GUIDE

DEVICE TYPE	PACKAGE/TEMPERATURE COMBINATIONS: FLAT PACK W TYPE (MIL / COML)	CAVITY DIP J TYPE (MIL / COML)	MOLDED DIP N TYPE (MIL / COML)	AVAILABILITY: IN PRODUCTION	FUTURE PRODUCT	LIT STAT
Series 54/74						
DM5400/DM7400 Quad 2-Input NAND Gate	● / ●	● / ●	● / ●	●		D
DM5401/DM7401 Quad 2-Input NAND Gate (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5402/DM7402 Quad 2-Input NOR Gate	● / ●	● / ●	● / ●	●		D
DM5403/DM7403 Quad 2-Input NAND Gate (Open Collector)	N/A	● / ●	● / ●	●		D
DM5404/DM7404 Hex Inverter	● / ●	● / ●	● / ●	●		D
DM5405/DM7405 Hex Inverter (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5406/DM7406 30 mA 30V Hex Inverter (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5407/DM7407 30 mA 30V Hex Buffer (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5408/DM7408 Quad 2-Input AND Gate	● / ●	● / ●	● / ●	●		D
DM5409/DM7409 Quad 2-Input AND Gate (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5410/DM7410 Triple 3-Input NAND Gate	● / ●	● / ●	● / ●	●		D
DM5411/DM7411 Triple 3-Input AND Gate	N/A	● / ●	● / ●	●		D
DM5413/DM7413 Dual Schmitt Trigger	● / ●	● / ●	● / ●	●		D
DM5414/DM7414 Hex Schmitt Trigger	● / ●	● / ●	● / ●	●		D
DM5416/DM7416 30 mA 15V Hex Inverter (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5417/DM7417 30 mA 15V Hex Buffer (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5420/DM7420 Dual 4-Input NAND Gate	● / ●	● / ●	● / ●	●		D
DM5423/DM7423 Exp Dual 4 NOR Gate	● / ●	● / ●	● / ●	●		D
DM5425/DM7425 Dual 4 NOR Gate	● / ●	● / ●	● / ●	●		D
DM5426/DM7426 Quad 2 NAND Gate (15V, O.C.)	N/A	● / ●	● / ●	●		D
DM5427/DM7427 Triple 3 NOR Gate	● / ●	● / ●	● / ●	●		D
DM5430/DM7430 8-Input NAND Gate	● / ●	● / ●	● / ●	●		D
DM5432/DM7432 Quad 2-Input OR Gate	● / ●	● / ●	● / ●	●		D
DM5437/DM7437 Quad 2 NAND Buffer	● / ●	● / ●	● / ●	●		D
DM5438/DM7438 Quad 2 NAND Buffer (Open Collector)	● / ●	● / ●	● / ●	●		D
DM5440/DM7440 Dual 4-Input NAND Buffer	● / ●	● / ●	● / ●	●		D
DM5441A/DM7441A NIXIE Driver	● / ●	● / ●		●		D
DM5442/DM7442 BCD-to-Decimal Decoder	● / ●	● / ●	● / ●	●		D
DM5445/DM7445 BCD-to-Decimal Decoder/Driver (30V, 80 mA)	● / ●	● / ●	● / ●	●		D
DM5446A/DM7446A BCD-to 7 Segment Decoder/Driver (40 mA, 30V)	● / ●	● / ●	● / ●	●		D
DM5447A/DM7447A BCD-to-7 Segment Decoder/Driver (40 mA, 15V)	● / ●	● / ●	● / ●	●		D
DM5448/DM7448 BCD-to-7 Segment Decoder/Driver (Active High)	● / ●	● / ●	● / ●	●		D
DM5450/DM7450 Expandable Dual 2-Input AND-OR INVERT Gate	● / ●	● / ●	● / ●	●		D

DEVICE TYPE	PACKAGE/TEMPERATURE COMBINATIONS: FLAT PACK W TYPE (MIL / COML)	CAVITY DIP J TYPE (MIL / COML)	MOLDED DIP N TYPE (MIL / COML)	AVAILABILITY: IN PRODUCTION	FUTURE PRODUCT	LIT STAT
DM5451/DM7451 Dual 2-Input AND-OR INVERT Gate	● / ●	● / ●	● / ●	●		D
DM5453/DM7453 Expandable 2-Input AND-OR-INVERT Gate	● / ●	● / ●	● / ●	●		D
DM5454/DM7454 2-Input AND-OR INVERT Gate	● / ●	● / ●	● / ●	●		D
DM5460/DM7460 Dual 4-Input Expander	● / ●	● / ●	● / ●	●		D
DM5470/DM7470 Edge-Triggered JK Flip-Flop	● / ●	● / ●	● / ●	●		D
DM5472/DM7472 JK-M/S Flip-Flop	● / ●	● / ●	● / ●	●		D
DM5473/DM7473 Dual JK M/S Flip-Flop (Clear)	● / ●	● / ●	● / ●	●		D
DM5474/DM7474 Dual D-Type Flip-Flop (Preset and Clear)	● / ●	● / ●	● / ●	●		D
DM5475/DM7475 Quad Latch	● / ●	● / ●	● / ●	●		D
DM5476/DM7476 Dual JK M/S Flip-Flop (Preset and Clear)	● / ●	● / ●	● / ●	●		D
DM5483/DM7483 4 Bit Binary Full Adder	● / ●	● / ●	● / ●	●		D
DM5485/DM7485 4 Bit Comparator	● / ●	● / ●	● / ●	●		D
DM5486/DM7486 Quad 2-Input Exclusive-OR Gate	● / ●	● / ●	● / ●	●		D
DM5490A/DM7490A Decade Counter	● / ●	● / ●	● / ●	●		D
DM5491A/DM7491A 8 Bit Serial Shift Register	● / ●	● / ●	● / ●	●		D
DM5492A/DM7492A Divide-by-12 Counter	● / ●	● / ●	● / ●	●		D
DM5493A/DM7493A 4 Bit Binary Counter	● / ●	● / ●	● / ●	●		D
DM5495/DM7495 4 Bit R-S-L-S Register	● / ●	● / ●	● / ●	●		D
DM5496/DM7496 5 Bit Parallel-In Parallel-Out Shift Register	● / ●	● / ●	● / ●	●		D
DM54107/DM74107 Dual JK Flip-Flop	N/A	● / ●	● / ●	●		D
DM54109/DM74109 Dual JK Flip-Flop (FSC 9024)	● / ●	● / ●	● / ●	●		D
DM54121/DM74121 Monostable Multivibrator	● / ●	● / ●	● / ●	●		D
DM54123/DM74123 Dual Monostable Multivibrator	● / ●	● / ●	● / ●	●		D
DM54125/DM74125 TRI-STATE Quad 2-Input Buffer (DM8093)	● / ●	● / ●	● / ●	●		D
DM54126/DM74126 TRI-STATE Quad 2-Input Buffer (DM8094)	● / ●	● / ●	● / ●	●		D
DM54132/DM74132 Quad Schmitt Trigger	● / ●	● / ●	● / ●	●		D
DM54141/DM74141 NIXIE Driver	● / ●	● / ●	● / ●	●		D
DM54145/DM74145 BCD-to-Decimal Decoder/Driver (15V, 80 mA)	● / ●	● / ●	● / ●	●		D
DM54147/DM74147 10-4 Priority Encoder	● / ●	● / ●	● / ●	●		D
DM54148/DM74148 8/3 Priority Encoder (FSC 9318)	F / F	● / ●	● / ●	●		D
DM54150/DM74150 16-1 Multiplexer	F / F	● / ●	● / ●	●		D
DM54151A/DM74151A 8-Channel Multiplexer	● / ●	● / ●	● / ●	●		D

TTL STATUS GUIDE (Continued)

DEVICE TYPE		PACKAGE/TEMPERATURE COMBINATIONS: FLAT PACK W-TYPE MIL	FLAT PACK W-TYPE COM'L	CAVITY DIP J-TYPE MIL	CAVITY DIP J-TYPE COM'L	MOLDED DIP N-TYPE MIL	MOLDED DIP N-TYPE COM'L	AVAILABILITY: IN PRODUCTION	FUTURE PRODUCT	LIT STAT
DM54153/DM74153	Dual 4-1 Multiplexer	●	●	●	●		●	●		D
DM54154/DM74154	4-16 Decoder/Demultiplexer (FSC 9311)	F	F	●	●		●	●		D
DM54155/DM74155	Dual 2-4 Demultiplexer	●	●	●	●		●	●		D
DM54156/DM74156	Dual 2-4 Demultiplexer (Open Collector)	●	●	●	●		●	●		D
DM54157/DM74157	Quad 2-Input Multiplexer (FSC 9322)	●	●	●	●		●	●		D
DM54160A/DM74160A	Presettable Decade Counter (FSC 9310)	●	●	●	●		●	●		D
DM54161A/DM74161A	Presettable Binary Counter (FSC 9316)	●	●	●	●		●	●		D
DM54162A/DM74162A	Presettable Decade Counter (Sync Clear)	●	●	●	●		●	●		D
DM54163A/DM74163A	Presettable Binary Counter (Sync Clear)	●	●	●	●		●	●		D
DM54164/DM74164	8-Bit Serial-In, Parallel-Out Shift Reg (DM8570)	●	●	●	●		●	●		D
DM54165/DM74165	8-Bit Parallel-In, Serial-Out Shift Reg (DM8590)	●	●	●	●		●	●		D
DM54166/DM74166	8-Bit Parallel-In, Serial-Out Shift Register	N/A		●	●		●	●		D
DM54170/DM74170	4 x 4 Register File	N/A			●		●	●		D
DM54173/DM74173	**TRI-STATE Quad D Register (DM8551)**	●	●	●	●		●	●		D
DM54174/DM74174	Hex D Flip-Flop	●	●	●	●		●	●		D
DM54175/DM74175	Quad D Flip-Flop	●	●	●	●		●	●		D
DM54176/DM74176	Presettable Decade Counter (SIG 8280)	N/A		●	●		●	●		D
DM54177/DM74177	Presettable Binary Counter (SIG8281)	N/A		●	●		●	●		D
DM54180/DM74180	Parity Generator/Checker	●	●	●	●		●	●		D
DM54181/DM74181	Arithmetic Logic Unit	N/A		●	●		●	●		D
DM54182/DM74182	Carry Look Ahead for ALU	N/A		●	●		●	●		D
DM54184/DM74184	BCD-to-Binary Converter	●	●	●	●		●	●		D
DM54185A/DM74185A	Binary-to-BCD Converter	●	●	●	●		●	●		D
DM54190/DM74190	Sync Up/Down Decade Counter (Mode Control)	●	●	●	●	●	●	●		D
DM54191/DM74191	Sync Up/Down Binary Counter (Mode Control)	●	●	●	●	●	●	●		D
DM54192/DM74192	Sync Up/Down Decade Ctr (DM8560)	●	●	●	●		●	●		D
DM54193/DM74193	Sync Up/Down Binary Ctr (DM8563)	●	●	●	●		●	●		D
DM54194/DM74194	4-Bit Bi-Directional Shift Register	●	●	●	●		●	●		D
DM54195/DM74195	4-Bit Parallel Shift Register	●	●	●	●		●	●		D
DM54196/DM74196	Presettable Decade Counter (SIG 8290)	N/A		●	●	●	●	●		D

DEVICE TYPE		PACKAGE/TEMPERATURE COMBINATIONS: FLAT PACK W-TYPE MIL	FLAT PACK W-TYPE COM'L	CAVITY DIP J-TYPE MIL	CAVITY DIP J-TYPE COM'L	MOLDED DIP N-TYPE MIL	MOLDED DIP N-TYPE COM'L	AVAILABILITY: IN PRODUCTION	FUTURE PRODUCT	LIT STAT
DM7520/DM8520	Modulo-N Divider	●	●	●	●		●	●		D
DM7542/DM8542	**TRI-STATE Quad 1-0 Register**	●	●	●	●		●	●		D
DM7544/DM8544	Contact Bounce Eliminator	●	●	●	●	●	●	●		D
DM7546/DM8546	**TRI-STATE 8-Bit Universal Shift Register**	●	●	●	●		●	●		D
DM7551/DM8551	**TRI-STATE Quad D Register (DM74173)**	●	●	●	●		●	●		D
DM7552/DM8552	**TRI-STATE Decade Counter/Latch**	●	●	●	●		●	●		D
DM7553/DM8553	**TRI-STATE 8-Bit Latch**	●	●	●	●		●	●		D
DM7554/DM8554	**TRI-STATE Binary Counter/Latch**	●	●	●	●		●	●		D
DM7555/DM8555	**TRI-STATE Presettable Decade Counter**	●	●	●	●		●	●		D
DM7556/DM8556	**TRI-STATE Presettable Binary Counter**	●	●	●	●		●	●		D
DM7560/DM8560	Up/Down Decade Counter (DM74192)	●	●	●	●		●	●		D
DM7563/DM8563	Up/Down Binary Counter (DM74193)	●	●	●	●		●	●		D
DM7570/DM8570	8-Bit Serial-In, Parallel-Out Shift Reg (DM74164)	●	●	●	●		●	●		D
DM7590/DM8590	8-Bit Parallel-In, Serial-Out Shift Reg (DM74165)	●	●	●	●		●	●		D
DM7613/DM8613	Quad Gated D Flip-Flop	●	●	●	●	●	●	●		D
DM7853/DM8853	Dual Monostable Multivibrator (Double Edge)	●	●	●	●		●	●		D
DM7875A/DM8875A	**TRI-STATE 4-Bit Multiplier**	N/A		●	●		●	●		D
DM7875B/DM8875B	**TRI-STATE 4-Bit Multiplier**	N/A		●	●		●	●		D
DM8898	**TRI-STATE DM74184**	N/A					●	●		D
DM8899	**TRI-STATE DM74185A**	N/A					●	●		D
Signetics TTL										
DM7280/DM8280	Presettable Decade Counter (DM74176)	●	●	●	●		●	●		D
DM7281/DM8281	Presettable Binary Counter (DM74177)	●	●	●	●		●	●		D
DM7288/DM8288	Presettable Divide-by-12 Counter	●	●	●	●		●	●		D
DM7290/DM8290	Improved DM7280 Presettable Decade Ctr (DM74196)	●	●	●	●	●	●	●		D
DM7291/DM8291	Improved DM7281 Presettable Binary Ctr (DM74197)	●	●	●	●		●	●		D
Fairchild TTL										
DM9002C	Quad 2-Input NAND Gate	N/A		●		●	●	●		D
DM9003C	Triple 3-Input NAND Gate	N/A		●		●	●	●		D

DM54197/DM74197	Presettable Binary Counter (SIG 8291)	N/A	●	●	●	●	●		D
DM54198/DM74198	8-Bit Parallel-In, Parallel-Out Shift Register	N/A	●	●		●	●		D
DM54199/DM74199	8-Bit Parallel-In, Parallel-Out Shift Register	N/A	●	●		●	●		D
DM54251/DM74251	TRI-STATE 8-Channel Multiplexer (DM81211)	●	●	●		●	●		D
DM54259/DM74259	8 Bit Addressable Latch (DM9334)	●	●	●	●		●		D
DM54365/DM74365	TRI-STATE Hex Buffer (DM8095)	●	●	●			●		D
DM54366/DM74366	TRI-STATE Hex Inverter (DM8096)	●	●	●			●		D
DM54367/DM74367	TRI-STATE Hex Buffer (4-2) (DM8097)	●	●	●			●		D
DM54368/DM74368	TRI-STATE Hex Inverter (4-2) (DM8098)	●	●	●			●		D
DM7090/DM8090	Quad Inverter, Dual 2 NAND Buffer	●	●	●	●	●	●		D
DM7091/DM8091	Quad 2-Input NAND Buffer	●	●	●	●	●	●		D
DM7092/DM8092	Dual 5-Input NAND Gate	●	●	●	●	●	●		D
DM7093/DM8093	TRI-STATE Quad 2-Input Buffer (DM74125)	●	●	●	●	●	●		D
DM7094/DM8094	TRI-STATE Quad 2-Input Buffer (DM74126)	●	●	●	●	●	●		D
DM7095/DM8095	TRI-STATE Hex Buffer (DM74365)	●	●	●	●		●		D
DM7096/DM8096	TRI-STATE Hex Inverter (DM74366)	●	●	●	●		●		D
DM7097/DM8097	TRI-STATE Hex Buffer (4-2) (DM74367)	●	●	●	●		●		D
DM7098/DM8098	TRI-STATE Hex Inverter (4-2) (DM74368)	●	●	●	●		●		D
DM7099/DM8099	TRI-STATE 5400 Gate	●	●	●	●	●	●		D
DM7121/DM8121	TRI-STATE DM74151 (DM74251)	●	●	●	●		●		D
DM7123/DM8123	TRI-STATE 9322	F	F	●	●		●		D
DM7130/DM8130	10-Bit Comparator	F	F	●	●		●		D
DM7131/DM8131	6-Bit Comparator with Hi-Z Inputs	●	●	●	●		●		D
DM7136/DM8136	6-Bit Comparator with Hi-Z Inputs (Open Collector)	●	●	●	●		●		D
DM7160/DM8160	6-Bit Comparator	●	●	●	●		●		D
DM7200/DM8200	4-Bit Digital Comparator	●	●	●	●	●	●		D
DM7210/DM8210	8-Channel Multiplexer	●	●	●	●		●		D
DM7211/DM8211	8-Channel Multiplexer with Strobe	●	●	●	●		●		D
DM7214/DM8214	TRI-STATE DM74153	●	●	●	●		●		D
DM7219/DM8219	TRI-STATE DM74150	F	F	●	●		●		D
DM7220/DM8220	Parity Generator/Checker	●	●	●	●	●	●		D
DM7223/DM8223	1 8 Demultiplexer	N/A	●	●			●		D
DM7230/DM8230	TRI-STATE Demultiplexer	●	●	●	●		●		D
DM7511/DM8511	Dual Gated D Flip-Flop	●	●	●	●	●	●		D
DM7512/DM8512	Dual Gated JK Flip-Flop	●	●	●	●	●	●		D

DM9000/DM8000	Dual 4 Input NAND Gate	N/A			●		●	●	D
DM9005C	Expandable Dual 2 Input AND OR INVERT Gate	N/A			●		●	●	D
DM9006C	Dual 4 Input Expander	N/A			●		●	●	D
DM9008C	Expandable 2 2 2 3 Input AND OR INVERT Gate	N/A			●		●	●	D
DM9009C	Dual 4 Input NAND Buffer	N/A			●		●		D
DM9012C	Quad 2 Input NAND Gate (Open Collector)	N/A			●		●		D
DM9016C	Hex Inverter	N/A			●		●		D
DM9024/DM8024	Dual JK Flip Flop (DM74109)	●	●	●		●	●		D
DM9300/DM8300	4-Bit Parallel Shift Register	●	●	●			●		D
Fairchild TTL (Cont'd)									
DM9301/DM8301	1-of-10 Decoder	●	●	●	●		●	●	D
DM9309/DM8309	Dual 4 Input Multiplexer	●	●	●	●		●	●	D
DM9310/DM8310	Synchronous 4 Bit Decade Counter (DM74160A)	●	●	●	●		●		D
DM9311/DM8311	4 16 Decoder/Demultiplexer (DM74154)	●	●	●	●		●		D
DM9312/DM8312	8 Input Multiplexer	●	●	●	●		●		D
DM9316/DM8316	Synchronous 4 Bit Binary Counter (DM74161A)	●	●	●	●		●	●	D
DM9318/DM8318	8/3 Priority Encoder (DM74148)	●	●	●	●		●	●	D
DM9322/DM8322	Quad 2 Input Multiplexer (DM74157)	●	●	●	●		●	●	D
DM9334/DM8334	8 Bit Addressable Latch (DM74259)	●	●	●	●	●	●	●	D
DM9601/DM8601	Monostable Multivibrator	●	●	●	●	●	●	●	D
DM9602/DM8602	Dual Monostable Multivibrator (with Reset)	●	●	●	●	●	●	●	D
AMD TTL									
DM2502/DM2502C	Successive Approximation Register	●	●	●	●		●	●	D
DM2503/DM2503C	Successive Approximation Register	●	●	●	●		●	●	D
DM2504/DM2504C	Successive Approximation Register	F	F	●	●		●	●	D
Series 54LS/74LS									
DM54LS00/DM74LS00	Quad 2 Input NAND Gate	●	●	●	●	●	●	●	D
DM54LS01/DM74LS01	Quad 2 Input NAND Gate (Open Collector)	●	●	●	●	●	●	●	D
DM54LS02/DM74LS02	Quad 2 Input NOR Gate	●	●	●	●	●	●	●	D
DM54LS03/DM74LS03	Quad 2 Input NAND Gate (Open Collector)	●	●	●	●	●	●	●	D
DM54LS04/DM74LS04	Hex Inverter	●	●	●	●	●	●	●	D
DM54LS05/DM74LS05	Hex Inverter (Open Collector)	●	●	●	●	●	●	●	D
DM54LS08/DM74LS08	Quad 2 Input AND Gate	●	●	●	●	●	●	●	D
DM54LS09/DM74LS09	Quad 2 Input AND Gate (Open Collector)	●	●	●	●	●	●	●	D
DM54LS10/DM74LS10	Triple 3 Input NAND Gate	●	●	●	●	●	●	●	D
DM54LS11/DM74LS11	Triple 3 Input AND Gate	●	●	●	●	●	●	●	D
DM54LS12/DM74LS12	Triple 3 Input NAND Gate (Open Collector)	●	●	●	●	●	●	●	D

TTL STATUS GUIDE (Continued)

DEVICE TYPE	PACKAGE TEMPERATURE COMBINATIONS: FLAT PACK (W-TYPE) MIL	FLAT PACK (W-TYPE) COML	CERAMIC DIP (J-TYPE) MIL	CERAMIC DIP (J-TYPE) COML	MOLDED DIP (N-TYPE) MIL	MOLDED DIP (N-TYPE) COML	AVAILABILITY: IN PRODUCTION	AVAILABILITY: FUTURE PRODUCT	LIT STAT
DM54LS13/DM74LS13 Dual 4 Input NAND Schmitt Trigger	●	●	●	●	●	●	●		D
DM54LS14/DM74LS14 Hex Schmitt Trigger	●	●			●	●	●		D
DM54LS15/DM74LS15 Triple 3 Input AND Gate (Open Collector)	●	●			●	●	●		D
DM54LS20/DM74LS20 Dual 4 Input NAND Gate	●	●	●	●	●	●	●		D
DM54LS21/DM74LS21 Dual 4 Input AND Gate	●	●			●	●	●		D
DM54LS22/DM74LS22 Dual 4 Input NAND Gate (Open Collector)	●	●	●	●	●	●	●		D
DM54LS26/DM74LS26 Quad 2 Input High Voltage NAND Gate	●	●	●	●	●	●	●		D
DM54LS27/DM74LS27 Triple 3 NOR Gate	●	●	●	●	●	●	●		D
DM54LS30/DM74LS30 8 Input NAND Gate	●	●	●	●	●	●	●		D
DM54LS32/DM74LS32 Quad 2 Input OR Gate	●	●	●	●	●	●	●		D
DM54LS37/DM74LS37 Quad 2 Input NAND Buffer	●	●	●	●	●	●	●		D
DM54LS38/DM74LS38 Quad 2 Input NAND Buffer (Open Collector)	●	●	●	●	●	●	●		D
DM54LS40/DM74LS40 Dual 4 Input NAND Buffer	●	●	●	●	●	●	●		D
DM54LS42/DM74LS42 BCD to Decimal Decoder	●	●	●	●	●	●	●		D
DM54LS47/DM74LS47 BCD 7 Segment Decoder Driver	●	●	●	●	●	●	●		D
DM54LS48/DM74LS48 BCD 7 Segment Decoder Driver	●	●	●	●	●	●	●		D
DM54LS49/DM74LS49 BCD 7 Segment Decoder Driver	●	●			●	●	●		D
DM54LS51/DM74LS51 Dual 2 Input AND-OR-INVERT Gate	●	●	●	●	●	●	●		D
DM54LS54/DM74LS54 2-Input AND-OR-INVERT Gate	●	●	●	●	●	●	●		D
DM54LS55/DM74LS55 Dual 4 Input AOI Gate	●	●			●	●	●		D
DM54LS73/DM74LS73 Dual JK M/S Flip-Flop (Clear)	●	●	●	●	●	●	●		D
DM54LS74/DM74LS74 Dual D-Type Flip-Flop (Preset and Clear)	●	●	●	●	●	●	●		D
DM54LS75/DM74LS75 Quad Latch	●	●	●	●	●	●	●		D
DM54LS76/DM74LS76 Dual JK M/S Flip-Flop (Preset and Clear)	●	●	●	●	●	●	●		D
DM54LS77/DM74LS77 Quad Latch, No Q Output	● N/A		Dice Only						D
DM54LS78/DM74LS78 Dual JK Flip-Flop (Pre , Comm Clk , Comm Clr)	●	●	●	●	●	●	●		D
DM54LS83A/DM74LS83A 4-Bit Binary Full Adder	●	●	●	●	●	●	●		D
DM54LS85/DM74LS85 4 Bit Magnitude Comparator	●	●	●	●	●	●	●		D
DM54LS86/DM74LS86 Quad 2-Input Exclusive-OR Gate	●	●	●	●	●	●	●		D
DM54LS90/DM74LS90 Decade Counter	●	●	●	●	●	●	●		D
DM54LS92/DM74LS92 Divide-by-12 Counter	●	●	●	●	●	●	●		D
DM54LS93/DM74LS93 4-Bit Binary Counter	●	●	●	●	●	●	●		D
DM54LS195A/DM74LS195A 4 Bit Parallel Access Shift Register								●	⊟
DM54LS196/DM74LS196 Presettable Decade Counter	●	●	●	●	●	●	●		⊟
DM54LS197/DM74LS197 Presettable Binary Counter	●	●	●	●	●	●	●		⊟
DM54LS221/DM74LS221 Dual One Shot with Schmitt Trigger Inputs					●	●	●		⊟
DM54LS240/DM74LS240 TRI-STATE Octal Line Driver								●	
DM54LS241/DM74LS241 TRI-STATE Octal Line Driver								●	
DM54LS242/DM74LS242 Quadruple Bus Transceiver								●	
DM54LS243/DM74LS243 Quadruple Bus Transceiver								●	
DM54LS244/DM74LS244 TRI-STATE Octal Line Driver								●	
DM54LS247/DM74LS247 BCD 7 Segment Decoder Driver (O.C.)	●	●	●	●	●	●	●		
DM54LS248/DM74LS248 BCD 7 Segment Decoder Driver	●	●	●	●	●	●	●		
DM54LS249/DM74LS249 BCD 7 Segment Decoder Driver (O.C.)	●	●	●	●	●	●	●		
DM54LS251/DM74LS251 TRI-STATE LS151 Multiplexer								●	D
DM54LS253/DM74LS253 TRI-STATE DM74LS153	●	●	●	●	●	●	●		D
DM54LS257/DM74LS257 TRI-STATE DM74LS157	●	●	●	●	●	●	●		D
DM54LS258/DM74LS258 TRI-STATE DM74LS158	●	●	●	●	●	●	●		D
DM54LS266/DM74LS266 Quad Exclusive NOR Gate (O.C.)	●	●	●	●	●	●	●		D
DM54LS279/DM74LS279 Quad S-R Latch	●	●	●	●	●	●	●		D
DM54LS283/DM74LS283 4 Bit Binary Adder with Fast Carry	●	●	●	●	●	●	●		D
DM54LS290/DM74LS290 DM74LS90 with Corner Power Pins	●	●	●	●	●	●	●		
DM54LS293/DM74LS293 DM74LS93 with Corner Power Pins	●	●	●	●	●	●	●		
DM54LS352/DM74LS352 Inverting Version of DM74LS153	●	●	●	●	●	●	●		
DM54LS353/DM74LS353 Inverting Version of DM74LS253	●	●	●	●	●	●	●		
DM54LS365/DM74LS365 TRI-STATE Hex Buffer	●	●	●	●	●	●	●		D
DM54LS366/DM74LS366 TRI-STATE Hex Buffer	●	●	●	●	●	●	●		D
DM54LS367/DM74LS367 TRI-STATE Hex Buffer	●	●	●	●	●	●	●		D
DM54LS368/DM74LS368 TRI-STATE Hex Buffer	●	●	●	●	●	●	●		D
DM54LS373/DM74LS373 TRI-STATE Octal Latch	●	●	●	●	●	●	●		
DM54LS374/DM74LS374 TRI-STATE Octal D Flip-Flop	N/A		●	●	●	●	●		D
DM54LS386/DM74LS386 Quad Exclusive OR Gate	●	●	●	●	●	●	●		D
DM54LS670/DM74LS670 TRI-STATE 4 By 4 Register File	●	●	●	●	●	●	●		D
DM71LS95/DM81LS95 TRI-STATE Octal Buffer	N/A		N/A		●	●	●		D
DM71LS96/DM81LS96 TRI-STATE Octal Buffer	N/A		N/A		●	●	●		D
DM71LS97/DM81LS97 TRI-STATE Octal Buffer	N/A		N/A		●	●	●		D
DM71LS98/DM81LS98 TRI-STATE Octal Buffer	N/A		N/A		●	●	●		D

DM54LS107/DM74LS107	Dual JK Flip-Flop	●	●	●	●	●	●			D
DM54LS109/DM74LS109	Dual JK Flip-Flop	●	●	●	●	●	●			D
DM54LS112/DM74LS112	Dual JK Flip-Flop (Preset and Clear)	●	●	●	●	●	●			D
DM54LS113/DM74LS113	Dual JK Flip-Flop (Preset)	●	●	●	●	●	●			D
DM54LS114/DM74LS114	Dual JK Flip-Flop (Pre. Comm Clk .Comm Clr.)	●	●	●	●	●	●			D
DM54LS122/DM74LS122	Retriggerable One Shot (Clear)					●	●	●		D
DM54LS123/DM74LS123	Dual Monostable Multivibrator					●	●	●		D
DM54LS125/DM74LS125	TRI-STATE Quad Buffer	●	●	●	●	●	●			D
DM54LS126/DM74LS126	**TRI-STATE Quad Buffer**	●	●	●	●	●	●			D
DM54LS132/DM74LS132	Quad 2-Input NAND Schmitt Trigger	●	●	●	●	●	●			D
DM54LS136/DM74LS136	Quad Exclusive-OR Gate (Open Collector)	●	●	●	●	●	●			D
DM54LS138/DM74LS138	Expandable 3/8 Decoder	●	●	●	●	●	●			D
DM54LS139/DM74LS139	Expandable Dual 2/4 Decoder	●	●	●	●	●	●			D
DM54LS151/DM74LS151	8-Channel Multiplexer	●	●	●	●	●	●			D
DM54LS153/DM74LS153	Dual 4-1 Multiplexer	●	●	●	●	●	●			D
DM54LS154/DM74LS154	4-16 Decoder/Demultiplexer	F	●	●	●	●	●			D
DM54LS155/DM74LS155	Dual 2-Line to 4-Line Decoder/Demultiplexer	●	●	●	●	●	●			D
DM54LS156/DM74LS156	Dual 2-Line to 4-Line Decoder/Demultiplexer	●	●	●	●	●	●			D
DM54LS157/DM74LS157	Quad 2-Input Multiplexer	●	●	●	●	●	●			D
DM54LS158/DM74LS158	Quad 2-Input Multiplexer	●	●	●	●	●	●			D
DM54LS160/DM74LS160	Presettable Decade Counter	●	●	●	●	●	●			D
DM54LS161/DM74LS161	Presettable Binary Counter	●	●	●	●	●	●			D
DM54LS162/DM74LS162	Presettable Decade Counter (Sync. Clear)	●	●	●	●	●	●			D
DM54LS163/DM74LS163	Presettable Binary Counter (Sync. Clear)	●	●	●	●	●	●			D
DM54LS164/DM74LS164	8-Bit Serial In, Parallel Out Shift Register	●	●	●	●	●	●			D
DM54LS165/DM74LS165	8-Bit PISO Shift Register							●		D
DM54LS168/DM74LS168	Sync. Up/Down Decade Counter	●	●	●	●	●	●			D
DM54LS169/DM74LS169	Sync. Up/Down Binary Counter	●	●	●	●	●	●			D
DM54LS170/DM74LS170	4 By 4 Register File	●	●	●	●	●	●			D
DM54LS173/DM74LS173	**TRI-STATE Quad D Register**	●	●	●	●	●	●			D
DM54LS174/DM74LS174	Hex D Flip Flop	●	●	●	●	●	●			D
DM54LS175/DM74LS175	Quad D Flip-Flop	●	●	●	●	●	●			D
DM54LS190/DM74LS190	Sync. Up/Dn Decade Cntr (Mode Control)	●	●	●	●	●	●			D
DM54LS191/DM74LS191	Sync. Up/Dn Binary Cntr (Mode Control)	●	●	●	●	●	●			D
DM54LS192/DM74LS192	Sync. Up/Down Decade Counter (2 Clocks)	●	●	●	●	●	●			D
DM54LS193/DM74LS193	Sync. Up/Down Binary Counter (2 Clocks)	●	●	●	●	●	●			D
DM54LS194A/DM74LS194A	4-Bit Bi-Direct Shift Register							●		D

DM76LS52/DM86LS52	8-Bit Universal I/O Register	●	●	●		●	●	●		
DM76LS62/DM86LS62	8-Bit Universal I/O Register	●	●	●		●	●	●		
Series 54L/74L										
DM54L00/DM74L00	Quad 2-Input NAND Gate	●	●	●	●	●	●	●		D
DM54L01/DM74L01	Quad 2-Input NAND Gate (Open Collector)	●	●	●	N/A	●	N/A	●		D
DM54L02/DM74L02	Quad 2-Input NOR Gate	●	●	●	●	●	●	●		D
DM54L03/DM74L03	Quad 2-Input NAND Gate (Open Collector)	N/A	●	●	●	●	●	●		D
DM54L04/DM74L04	Hex Inverter	●	●	●	●	●	●	●		D
DM54L05/DM74L05	Hex Inverter (Open Collector)	●	●	●	●	●	●	●		D
DM54L08/DM74L08	Quad 2-Input AND Gate	●	●	●	●	●	●	●		D
DM54L09/DM74L09	Quad 2-Input AND Gate (Open Collector)	●	●	●	●	●	●	●		D
DM54L10/DM74L10	Triple 3-Input NAND Gate	●	●	●	●	●	●	●		D
DM54L11/DM74L11	Triple 3-Input AND Gate	●	●	●	●	●	●	●		D
DM54L20/DM74L20	Dual 4-Input NAND Gate	●	●	●	●	●	●	●		D
DM54L26/DM74L26	Quad 2-Input NAND Gate (O.C., 15V)	N/A	●	●	●	●	●	●		D
DM54L30/DM74L30	8-Input NAND Gate	●	●	●	●	●	●	●		D
DM54L32/DM74L32	Quad 2-Input OR Gate	●	●	●	●	●	●	●		D
DM54L42A/DM74L42A	BCD-to-Decimal Decoder (1/10 power)	●	●	●	●	●	●	●		D
DM54L51/DM74L51	Dual AND-OR-INVERT Gate	●	●	●	●	●	●	●		D
DM54L54/DM74L54	2-2-2-3-3 Input AND-OR-INVERT Gate	●	●	●	●	●	●	●		D
DM54L55/DM74L55	4-Input AND-OR-INVERT Gate	●	●	●	●	●	●	●		D
DM54L71/DM74L71	R-S-M/S Flip-Flop	●	●	●	●	●	●	●		D
DM54L72/DM74L72	JK M/S Flip-Flop	●	●	●	●	●	●	●		D
DM54L73/DM74L73	Dual JK M/S Flip-Flop (Clear)	●	●	●	●	●	●	●		D
DM54L74/DM74L74	Dual D Flip-Flop (Preset and Clear)	●	●	●	●	●	●	●		D
DM54L75A/DM74L75A	Quad Latch (1/10 power)	●	●	●	●	●	●	●		D
DM54L78/DM74L78	Dual JK Flip-Flop (Pre. Comm. Clk. Comm Clr.)	●	●	●	●	●	●	●		D
DM54L85/DM74L85	4-Bit Comparator	●	●	●	●	●	●	●		D
DM54L86/DM74L86	Quad Exclusive-OR Gate	●	●	●	●	●	●	●		D
DM54L90/DM74L90	Decade Counter	●	●	●	●	●	●	●		D
DM54L91/DM74L91	8-Bit Serial Shift Register	●	●	●	●	●	●	●		D
DM54L93/DM74L93	Binary Counter	●	●	●	●	●	●	●		D
DM54L95/DM74L95	4-Bit Parallel Shift Register	●	●	●	●	●	●	●		D
DM54L98/DM74L98	4-Bit Storage Register	●	●	●	●	●	●	●		D
DM54L123A/DM74L123A	Dual Mono. Multivibrator (1/10 power)	●	●	●	●	●	●	●		D
DM54L154A/DM74L154A	4-16 Decoder (1/10 power)	F	F	●	●	●	●	●		D
DM54L157A/DM74L157A	Quad 2-Mux (93L22 Pinout, 1/10 power)	●	●	●	●	●	●	●		D
DM54L164A/DM74L164A	8-Bit Ser. In Par. Out Shift Reg. (1/10 power)	●	●	●	●	●	●	●		D
DM54L165A/DM74L165A	8-Bit Par. In Ser. Out Shift Reg. (1/10 power)	●	●	●	●	●	●	●		D

Note When low power device type has "A" on end, indicates T.I. device *not* one-tenth power.

TTL STATUS GUIDE (Continued)

DEVICE TYPE	PACKAGE/TEMPERATURE COMBINATIONS			AVAILABILITY		LIT STAT
DM54L192/DM74L192 Sync. 4-Bit Up-Down Ctr. (DM85L60)	●	●	●	●		D
DM54L193/DM74L193 Sync. 4-Bit Up-Down Ctr. (DM85L63)	●	●	●	●		D
DM80L06 Quad 2-Input NAND Gate (Passive Pull-Up)	N/A	N/A	●	●		D
DM70L95/DM80L95 TRI-STATE Hex Buffer	●	●	●	●		D
DM70L96/DM80L96 TRI-STATE Hex Inverter	●	●	●	●		D
DM70L97/DM80L97 TRI-STATE Hex Buffer (4 2)	●	●	●	●		D
DM70L98/DM80L98 TRI-STATE Hex Inverter (4 2)	●	●	●	●		D
DM71L22/DM81L22 Quad 2-Input Multiplexer (DM74L157A)	●	●	●	●		D
DM71L23/DM81L23 TRI-STATE 93L22 (1/10 power)	●	●	●	●		D
DM75L11/DM85L11 Dual Gated JK Flip-Flop	●	●	●	●		D
DM75L12/DM85L12 Dual Gated JK Flip-Flop	●	●	●	●		D
DM75L51/DM85L51 TRI-STATE Quad D Register	●	●	●	●		D
DM75L52/DM85L52 TRI-STATE Decade Ctr/Latch	●	●	●	●		D
DM75L54/DM85L54 TRI-STATE Binary Ctr/Latch	●	●	●	●		D
DM75L60/DM85L60 Up/Down Decade Counter (DM74L192)	●	●	●	●		D
DM75L63/DM85L63 Up/Down Binary Counter (DM74L193)	●	●	●	●		D
DM76L13/DM86L13 Quad Gated D Flip-Flop	●	●	●	●		D
DM76L24/DM86L24 4-Bit Magnitude Comparator	●	●	●	●		D
DM76L25/DM86L25 7-Segment to BCD Converter	●	●	●	●		D
DM76L70F/DM86L70F DM54L164A with Ctr. Pwr. Pins (F P. Only)	●	N/A	N/A	●		D
DM76L75/DM86L75 Presettable Decade Counter (93L10 Pinout)	●	●	●	●		D
DM76L76/DM86L76 Presettable Binary Counter (93L16 Pinout)	●	●	●	●		D
DM76L90/DM86L90 8-Bit Par. In, Ser. Out Shift Reg (DM74L165A)	●	●	●	●		D
DM76L93/DM86L93 Binary Counter (DM7493 Pin Out)	●	●	●	●		D
Series 54H/74H						
DM54H00/DM74H00 Quad 2-Input NAND Gate	N/A	●	●	●		D
DM54H01/DM74H01 Quad 2-Input NAND Gate (Open Collector)	N/A	●	●	●		D
DM54H04/DM74H04 Hex Inverter	N/A	●	●	●		D
DM54H05/DM74H05 Hex Inverter (Open Collector)	N/A	●	●	●		D
DM54H08/DM74H08 Quad 2-Input AND Gate	N/A	●	●	●		D
DM54H10/DM74H10 Triple 3-Input NAND Gate	N/A	●	●	●		D
DM54H11/DM74H11 Triple 3-Input AND Gate	N/A	●	●	●		D

DEVICE TYPE	PACKAGE/TEMPERATURE COMBINATIONS			AVAILABILITY		LIT STAT
DM957 Quad 2-Input Buffer	N/A	N/A	●	●		D
DM958 Quad 2-Input Power Gate	N/A	N/A	●	●		D
DM961 Dual 4-Input NAND Gate (with Expander)	N/A	N/A	●	●		D
DM9K2 Triple 3-Input NAND Gate	N/A	N/A	●	●		D
DM983 Triple 3-Input NAND Gate	N/A	N/A	●	●		D
DM1800 Dual 5-Input NAND Gate (6k Pull-up)	N/A	N/A	●	●		D
DM1801 Dual 5-Input NAND Gate (2k Pull-up)	N/A	N/A	●	●		D
DM9N11 Dual JK Flip-Flop Separate Clocks (6k Pull-up)	N/A	N/A	●	●		D
DM9094 Dual JK Flip-Flop (Separate Clocks, 2k Pull-up)	N/A	N/A	●	●		D
DM9097 Dual JK Flip-Flop (Common Clock, 2k Pull-up)	N/A	N/A	●	●		D
DM9099 Dual JK Flip-Flop (Common Clock, 6k Pull-up)	N/A	N/A	●	●		D
Series 74S						
DM74S00 Quad 2-Input NAND Gate	N/A	N/A	●	●		D
DM74S02 Quad 2-Input NOR Gate			●	●		D
DM74S03 Quad 2-Input NAND Gate (Open Collector)	N/A	N/A	●	●		D
DM74S04 Hex Inverter	N/A	N/A	●	●		D
DM74S05 Hex Inverter (Open Collector)	N/A	N/A	●	●		D
DM74S08 Quad 2-Input AND Gate					●	
DM74S10 Triple 3-Input NAND Gate	N/A	N/A	●	●		D
DM74S11 Triple 3-Input AND Gate	N/A	N/A	●	●		D
DM74S15 Triple 3-Input AND Gate (Open Collector)	N/A	N/A	●	●		D
DM74S20 Dual 4-Input AND Gate	N/A	N/A	●	●		D
DM74S22 Dual 4-Input NAND Gate (Open Collector)	N/A	N/A	●	●		D
DM74S30 8-Input NAND Gate	N/A	N/A	●	●		D
DM74S40 Dual 4-Input NAND Buffer	N/A	N/A	●	●		D
DM74S64 4-2-3-2-Input AND-OR-INVERT Gate	N/A	N/A	●	●		D
DM74S65 AND-OR-INVERT Gate (Open Collector)	N/A	N/A	●	●		D
DM74S74 Dual D Flip-Flop (Preset and Clear)	N/A	N/A	●	●		D
DM74S86 Quad Exclusive-OR Gate	N/A	N/A	●	●		D
DM74S112 Dual JK Flip-Flop (Preset and Clear)	N/A	N/A	●	●		D
DM74S113 Dual JK Flip-Flop (Preset)	N/A	N/A	●	●		D

DM54H70/DM74H20	Dual 4-Input NAND Gate	N/A	●	●	●	●		D
DM54H21/DM74H21	Dual 4-Input AND Gate	N/A	●	●	●	●		D
DM54H22/DM74H22	Dual 4-Input NAND Gate (Open Collector)	N/A	●	●	●	●		D
DM54H30/DM74H30	8-Input NAND Buffer	N/A	●	●	●	●		D
DM54H40/DM74H40	Dual 4-Input NAND Buffer	N/A	●	●	●	●		D
DM54H50/DM74H50	Expandable Dual 2-Input AND-OR-INVERT Gate	N/A	●	●	●	●		D
DM54H51/DM74H51	Dual 2-Input AND-OR-INVERT Gate	N/A	●	●	●	●		D
DM54H52/DM74H52	Expandable 2-2-2-3 Input AND-OR Gate	N/A	●	●	●	●		D
DM54H53/DM74H53	Expandable 2-2-2-3 Input AND-OR-INVERT Gate	N/A	●	●	●	●		D
DM54H54/DM74H54	2-Input AND-OR INVERT Gate	N/A	●	●	●	●		D
DM54H55/DM74H55	Expandable 4-Input AND-OR INVERT Gate	N/A	●	●	●	●		D
DM54H60/DM74H60	Dual 4-Input Expander	N/A	●	●	●	●		D
DM54H61/DM74H61	Triple 3-Input Expander	N/A	●	●	●	●		D
DM54H62/DM74H62	3-2-2-3-Input Expander	N/A	●	●	●	●		D
DM54H71/DM74H71	JK M/S Flip Flop	N/A	●	●	●	●		D
DM54H72/DM74H72	JK M/S Flip Flop	N/A	●	●	●	●		D
DM54H73/DM74H73	Dual JK M/S Flip-Flop (Clear)	N/A	●	●	●	●		D
DM54H74/DM74H74	Dual D Flip-Flop (Preset and Clear)	N/A	●	●	●	●		D
DM54H76/DM74H76	Dual JK M/S Flip-Flop (Preset and Clear)	N/A	●	●	●	●		D
DM54H78/DM74H78	Dual JK M/S Flip-Flop (Common Clock)	N/A	●	●	●	●		D
DM54H103/DM74H103	Dual JK Flip Flop (Clear)	N/A	●	●	●	●		D
DM54H106/DM74H106	Dual JK Flip Flop (Preset and Clear)	N/A	●	●	●	●		D
DM54H108/DM74H108	Dual JK Flip Flop (Common Clock	N/A	●	●	●	●		D
Series 930 DTL								
DM930	Dual 4-Input NAND Gate (with Expander)	N/A	N/A		●	●		D
DM932	Dual 4-Input Buffer (with Expander)	N/A	N/A		●	●		D
DM933	Dual 4-Input Extender	N/A	N/A		●	●		D
DM935	Hex Inverter	N/A	N/A		●	●		D
DM936	Hex Inverter	N/A	N/A		●	●		D
DM937	Hex Inverter	N/A	N/A		●	●		D
DM944	Dual 4-Input Power Gate (with Expander)	N/A	N/A		●	●		D
DM945	JK R/S Clocked Flip-Flop (6k Pull-up)	N/A	N/A		●	●		D
DM946	Quad 2-Input NAND Gate	N/A	N/A		●	●		D
DM948	JK R/S Clocked Flip-Flop (2k Pull-up)	N/A	N/A		●	●		D
DM949	Quad 2-Input NAND Gate	N/A	N/A		●	●		D

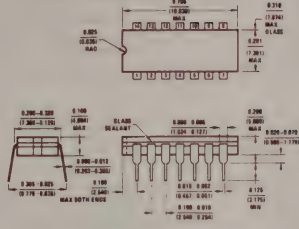
DM74S114	Dual JK Flip-Flop (Preset, Comm. Clock, Comm. Clear)	N/A	N/A		●	●		D
DM74S133	13-Input NAND Gate	N/A	N/A		●	●		D
DM74S134	TRI-STATE 12-Input NAND Gate	N/A	N/A		●	●		D
DM74S135	Quad Exclusive-OR/NOR Gate	N/A	N/A		●	●		D
DM74S138	Quad Exclusive-OR/NOR (Open Collector)	N/A	N/A		●	●		D
DM74S139	Expandable 4-Bit Comparator						●	D
DM74S140	Dual 4-Input NAND Driver	N/A	N/A	●	●			D
DM74S151	8-Input Multiplexer	N/A	N/A	●	●			D
DM74S153	Dual 4-Multiplexer	N/A	N/A	●	●			D
DM74S157	Quad 2-Input Multiplexer	N/A	N/A	●	●			D
DM74S158	Quad 2-Input Multiplexer (Inverted Outputs)	N/A	N/A	●	●			D
DM74S163	Synchronized 4-Bit Counter						●	D
DM74S174	Hex D Flip-Flop						●	D
DM74S175	Quad D Flip-Flop						●	D
DM74S181	Arithmetic Function Generator						●	D
DM74S189	64-Bit Random Access RAM						●	D
DM74S194	4-Bit Bidirectional Shift Register						●	D
DM74S195	Register Counter						●	
DM74S240	TRI-STATE Octal Line Driver						●	
DM74S241	TRI-STATE Octal Line Driver						●	
DM74S242	TRI-STATE Octal Line Driver						●	
DM74S251	TRI-STATE DM74S151						●	D
DM74S253	TRI-STATE DM74S153						●	D
DM74S257	TRI-STATE DM74S157						●	D
DM74S258	TRI-STATE DM74S158						●	D
DM74S280	9-Bit Generator	N/A	N/A	●	●			D
DM74S281	4-Bit Binary Adder						●	D
DM74S299	8-Bit Shift/Storage Register						●	
DM74S373	Octal D Flip Flop						●	
DM74S374	Octal D Flip-Flop						●	
DM74S381	Arithmetic Function Generator						●	

CODES FOR LIT STAT

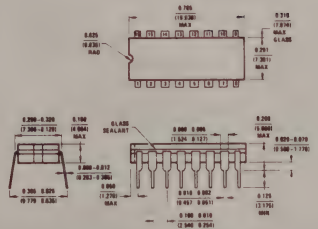
D The product is in the TTL Data Book as a full data sheet

Note: All products available with A+/B+ processing

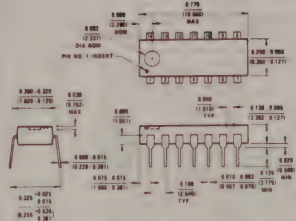
DIGITAL PACKAGES



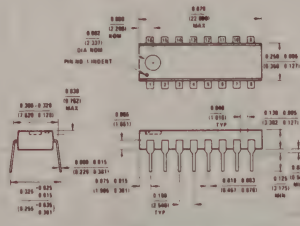
14-Pin Cavity Dual-In-Line Package (J)



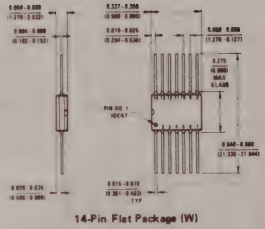
16-Pin Cavity Dual-In-Line Package (J)



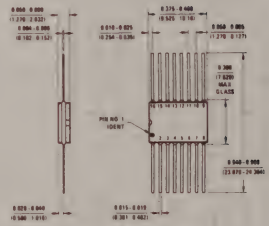
14-Pin Molded Dual-In-Line Package (N)



16-Pin Molded Dual-In-Line Package (N)



14-Pin Flat Package (W)



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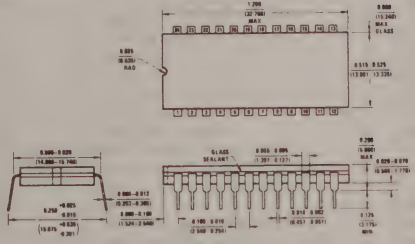
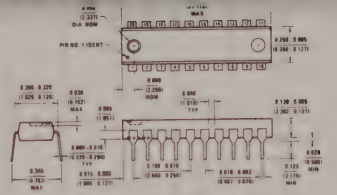
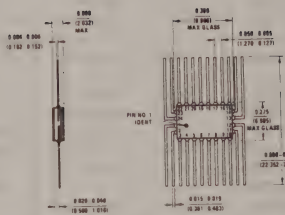


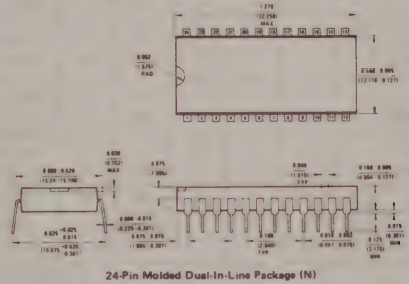
24-Pin Cavity Dual-In-Line Package (J)



20-Pin Molded Dual-In-Line Package (N)



24-Pin Flat Package (F)



24-Pin Molded Dual-In-Line Package (N)

CMOS STATUS/CROSS REFERENCE GUIDE

Product	Description	Status	Package			883	38510	Radiation Hardened	Equivalent Designations			
			N	J	W				RCA	Motorola	Fairchild	SSS
CD4000	Dual 3-Input NOR Gate Plus Inverter	Production	•	•	•				CD4000	MC14000		SCL4000
CD4001	Quad 2-Input NOR Gate	Production	•	•	•	•	•	•	CD4001	MC14001		SCL4001
CD4001B	Buffered Quad 2-Input NOR Gate	Production	•	•	•	•		•	CD4001B	MC14001B	40001B	SCL40001B
CD4002	Dual 4-Input NOR Gate	Production	•	•	•	•	•	•	CD4002	MC14002		SCL4002
CD4002B	Buffered Dual 4-Input NOR Gate	Production	•	•	•				CD40002B	MC14002B	40002B	SCL4002B
CD4006	18-Bit S/R	Production	•	•	•	•	•	•	CD4006	MC14006B	4006B	SCL4006B
CD4006B	18-Bit S/R	November	•	•	•				CD4006B	MC14006B	4006B	SCL4006B
CD4007	Dual Complementary Pair Plus Inverter	Production	•	•	•	•	•	•	CD4007	MC14007	4007	SCL4007
CD4008B	4-Bit Full Adder with Parallel Carry	Production	•	•	•	•		•	CD4008B	MC14008B	4008B	SCL4008B
CD4009	Hex Inverting Buffer	Production	•	•	•	•	•	•	CD4009			SCL4009
CD4010	Hex Buffer	Production	•	•	•	•	•	•	CD4010			SCL4010B
CD4011	Quad 2-Input NAND Gate	Production	•	•	•		•	•	CD4011	MC14011		SCL4011
CD4011B	Buffered Quad 2-Input NAND Gate	Production	•	•	•	•			CD4011B	MC14011B	4011B	SCL4011B
CD4012	Dual 4-Input NAND Gate	Production	•	•	•	•	•	•	CD4012	MC14012		SCL4012
CD4012B	Buffered Dual 4-Input NAND Gate	October	•	•	•				CD4012B	MC14012B	4012B	SCL4012B
CD4013B	Dual D Flip-Flop	Production	•	•	•	•	•	•	CD4013B	MC14013B	4013B	SCL4013B
CD4014	8-Bit S/R	Production	•	•	•	•	•	•	CD4014			
CD4014B	8-Bit S/R	November	•	•	•				CD4014B	MC14014B	4014B	SCL4014B
CD4015	Dual 4-Bit S/R	Production	•	•	•	•	•	•	CD4015			
CD4015B	Dual 4-Bit S/R	October	•	•	•				CD4015B	MC14015B	4015B	SCL4015B
CD4016	Quad Bilateral Switch	Production	•	•	•	•		•	CD4016	MC14016	4016B	SCL4016
CD4017B	Decade Counter Divider	Production	•	•	•	•		•	CD4017B	MC14017B	4017B	SCL4017B
CD4018B	Presettable Divide by "N" Counter	Production	•	•	•	•		•	CD4018B	MC14018B	4018B	SCL4018B

CD4021B	8-Bit S/R	November	•	•	•			•	CD4021B	MC14021B	4021B	SCL4021B
CD4022B	Divide-by-8-Counter Divider	Production	•	•	•	•		•	CD4022B	MC14022B	4022B	SCL4022B
CD4023	Triple 3-Input NAND Gate	Production	•	•	•		•	•	CD4023	MC14023		SCL4023
CD4023B	Buffered Triple 3-Input NAND Gate	Production	•	•	•	•			CD4023B	MC14023B	4023B	SCL4023B
CD4024B	7-Bit Binary Counter	Production	•	•	•	•		•	CD4024B	MC14024B	4024B	SCL4024B
CD4025	Triple 3-Input NOR Gate	Production	•	•	•	•	•	•	CD4025	MC14025		SCL4025
CD4025B	Buffered Triple 3-Input NOR Gate	Production	•	•	•	•			CD4025B	MC14025B	4025B	SCL4025B
CD4027B	Dual JK Flip-Flop	Production	•	•	•	•	•	•	CD4027B	MC14027B	4027B	SCL4027B
CD4028B	BCD-to-Decimal Decoder	Production	•	•	•	•		•	CD4028B	MC14028B	4028B	SCL4028B
CD4029B	Presettable Up/Down Counter	Production	•	•	•	•		•	CD4029B		4029B	SCL4029B
CD4030	Quad EX-OR Gate (MM74C86)	Production	•	•	•	•	•	•	CD4030		4030B	SCL4030B
CD4031B	64-Bit S/R	Production	•	•	•	•		•	CD4031B			
CD4034B	8-Bit S/R	Production	•	•	•	•			CD4034B	MC14034B	4034B	SCL4034B
CD4035B	4-Bit P-In—P-Out S/R	Production	•	•	•	•		•	CD4035B	MC14035B	4035B	SCL4035B
CD4040B	12-Bit Binary/Ripple Counter	Production	•	•	•	•		•	CD4040B	MC14040B	4040B	SCL4040B
CD4041	Quad True/Complement Buffer	Production	•	•	•	•		•	CD4041		4041	SCL4041
CD4042B	Quad D Latch	Production	•	•	•	•		•	CD4042B	MC14042B	4042B	SCL4042B
CD4043	Quad 3-State NOR R/S Latch	Production	•	•	•	•		•	CD4043			
CD4043B	Quad 3-State NOR /S Latch	December	•	•	•				CD4043B	MC14043B	4043B	SCL4043B
CD4044	Quad 3-State NAND R/S Latch	Production	•	•	•	•		•	CD4044			
CD4044B	Quad 3-State NAND R/S Latch	December	•	•	•				CD4044B	MC14044B	4044B	SCL4044B
CD4046B	Phase-Locked Loop	Production	•	•	•	•			CD4046B	MC14046B		SCL4046B
CD4047B	Monostable-Astable Multivibrator	Production	•	•	•	•			CD4047B			SCL4047B
CD4048B	Expandable 8-Input Gate	Production	•	•	•	•		•	CD4048B			
CD4049	Hex Inverting Buffer	Production	•	•	•	•	•	•	CD4049	MC14049	4049B	SCL4049
CD4050B	Hex Buffer	Production	•	•	•	•	•	•	CD4050B	MC14050B	4050B	SCL4050B
CD4051B	Single 8-Channel Multiplexer	Production	•	•	•	•		•	CD4051B	MC14051B	4051B	SCL4051B
CD4052B	Differential 4-Channel Multiplexer	Production	•	•	•	•		•	CD4052B	MC14052B	4052B	SCL4052B

CMOS STATUS/CROSS REFERENCE GUIDE (Continued)

Product	Description	Status	Package			883	38510	Radiation Hardened	Equivalent Designations			
			N	J	W				RCA	Motorola	Fairchild	SSS
CD4053B	Triple 2-Channel Multiplexer	Production	•	•	•	•		•	CD4053B	MC14053B	4053B	SCL4053B
CD4060B	14-Stage Ripple Carry Binary Counter & Osc.	Production	•	•	•	•			CD4060B			SCL4060B
CD4066B	Quad Bilateral Switch	Production	•	•	•	•		•	CD4066B	MC14066B	4066B	SCL4066B
CD4069	Hex Inverter (MM74C04)	Production	•	•	•	•			CD4069	MC14069	4069B	SCL4069
CD4070B	Quad Exclusive-OR Gate (MM74C86)	Production	•	•	•	•		•	CD4070B	MC14070B	4070B	SCL4070B
CD4071B	Quad 2-Input OR Gate	Production	•	•	•	•		•	CD4071B	MC14071B	4071B	SCL4071B
CD4072B	Buffered Dual 4-Input OR Gate	Production	•	•	•				CD4072B	MC14072B	4072B	SCL4072B
CD4073B	Triple 3-Input AND Gate	Production	•	•	•	•			CD4073B	MC14073B	4073B	SCL4073B
CD4075B	Triple 3-Input OR Gate	Production	•	•	•	•			CD4075B	MC14075B	4075B	SCL4075B
CD4076B	TRI-STATE® Quad D Flip-Flop (MM74C173)	Production	•	•	•	•		•	CD4076B	MC14076B	4076B	SCL4076B
CD4081B	Quad 2-Input AND Gate	Production	•	•	•	•		•	CD4081B	MC14081B	4081B	SCL4081
CD4082B	Buffered Dual 4-Input AND Gate	October	•	•	•				CD4082B	MC14082B	4082B	SCL4082B
CD4089B	Binary Rate Multiplier	Production	•	•	•	•			CD4089B			
CD4093B	Quad 2-Input NAND Schmitt Trigger	Production	•	•	•	•		•	CD4093B	MC14093B	4093B	SCL4093B
CD4099B	8-Bit Addressable Latch	Production	•	•	•	•			CD4099B	MC14099B	4099B	SCL4099B
CD40106B	Hex Schmitt Trigger (MM74C14)	Production	•	•	•	•			CD40106B			
CD40160B	Sync Decade Counter (MM74C160)	Production	•	•	•	•			CD40160B	MC14160B		SCL40160B
CD40161B	Sync Binary Counter (MM74C161)	Production	•	•	•	•			CD40161B	MC14161B		SCL40161B
CD40162B	Fully Sync Decade Counter (MM74C162)	Production	•	•	•	•			CD40162B	MC14162B		SCL40162B
CD40163B	Fully Sync Binary Counter (MM74C163)	Production	•	•	•	•			CD40163B	MC14163B		SCL40163B
CD40174B	Hex D Flip-Flop (MM74C174)	Production	•	•	•	•				MC14174B		SCL40174B
CD40175B	Quad D Flip-Flop (MM74C175)	Production	•	•	•	•				MC14174B		
CD40192B	Sync Up/Down Decade Counter (MM74C192)	Production	•	•	•	•			CD40192B			SCL40192B

CD4503B	Hex Bus Driver	(MM70C97)	Production	•	•		•					40195B	
CD4507B	Quad EX-OR Gate	(MM74C86)	Production	•	•						MC14503B		
CD4510B	BCD Up/Down Counter		Production	•	•	•	•				MC14507B		
CD4511B	BCD-to-7-Segment/Decoder/Driver		Production	•	•	•					MC14510B	4510B	SCL4510B
CD4512	8-Channel Data Selector		Production	•	•	•				CD4511B	MC14511B	4511B	SCL4511B
CD4514B	4-Bit Latch/4 to 16 Line Decoder (High)		Production	•	•						MC14512	4512B	SCL4512B
CD4515B	4-Bit Latch/4 to 16 Line decoder (Low)		Production	•	•					CD4514B	MC14514B	4514B	SCL4514B
CD4516B	Binary Up/Down Counter		Production	•	•	•	•			CD4515B	MC14515B	4515B	SCL4515B
CD4518B	Dual BCD Up Counter		Production	•	•	•	•				MC14516B	4516B	SCL4516B
CD4519B	4-Bit AND/OR Selector		Production	•	•	•	•			CD4518B	MC14518B	4518B	SCL4518B
CD4520B	Dual Binary Up Counter		Production	•	•	•					MC14519B	4519B	
CD4522B	Programmable Divide-by-N Counter (BCD)		Production	•	•					CD4520B	MC14520B	4520B	SCL4520B
CD4526B	Programmable Divide-by-N Counter (Binary)		Production	•	•						MC14522B		SCL4522B
CD4527B	BCD Rate/Multiplier		Production	•	•	•	•				MC14526B		SCL4526B
CD4528B	Dual Retriggerable/Resettable Monostable Multivibrator		Production	•	•	•				CD4527B	MC14527B		SCL4527B
											MC14528B	4528B	SCL4528B
CD4529B	Dual 4-Channel Analog Data Selector		Production	•	•	•					MC14529B		
CD4538B	Dual Precision Monostable Multivibrator		January	•	•						MC14538B		
CD4541B	Programmable Oscillator-Timer		January	•	•						MC14541B		
CD4543B	BCD-to-7-Segment Decoder (LCD)		Production	•	•						MC14543B		SCL4543B
CD4584B	Hex Schmitt Trigger		Production	•	•						MC14584B		SCL4584B
CD4723B	Dual 4-Bit Addressable Latch		Production	•	•		•					4723B	
CD4724B	8-Bit Addressable Latch		Production	•	•		•					4724B	
MM74C00	Quad 2-Input NAND Gate		Production	•	•	•	•						
MM74C02	Quad 2-Input NOR Gate		Production	•	•	•	•						
MM74C04	Hex Inverter		Production	•	•	•	•			CD4069	MC14069	4069B	SCL4069
MM74C08	Quad 2-Input NAND Gate		Production	•	•	•	•						
MM74C10	Triple 3-Input NAND Gate		Production	•	•	•	•						
MM74C14	Hex Schmitt Trigger	(MM74C14)	Production	•	•	•	•			CD40106B	MC14584	40014B	

CMOS STATUS/CROSS REFERENCE GUIDE (Continued)

Product	Description	Status	Package			883	38510	Radiation Hardened	Equivalent Designations			
			N	J	W				RCA	Motorola	Fairchild	SSS
MM74C20	Dual 4-Input NAND Gate	Production	•	•	•	•						
MM74C30	8-Input NAND Gate	Production	•	•	•	•						
MM74C32	Quad 2-Input OR Gate	Production	•	•	•	•						
MM74C42	BCD-to-Decimal Decoder	Production	•	•	•	•						
MM74C48	BCD-to-7-Segment Decoder	Production	•	•	•	•						
MM74C73	Dual JK Flip-Flop	Production	•	•	•	•						
MM74C74	Dual D Flip-Flop	Production	•	•	•	•						
MM74C76	Dual JK Flip-Flop	Production	•	•	•	•						
MM74C83	4-Bit Binary Full Adder	Production	•	•	•	•						
MM74C85	4-Bit Comparator	Production	•	•	•	•					40085B	
MM74C86	Quad EX-OR Gate	Production	•	•	•	•		•	CD4070B	MC14507B		SCL4070B
MM74C89	64-Bit RAM	Production	•	•	•	•						
MM74C90	Decade Counter	Production	•	•	•	•						
MM74C93	4-Bit Binary Counter	Production	•	•	•	•						
MM74C95	4-Bit R-S L-S Register	Production	•	•	•	•						
MM74C107	Dual JK Flip-Flop	Production	•	•	•	•						
MM74C150	16 to 1 Multiplexer	Production	•	•	•	•						
MM74C151	8-Channel Digital Multiplexer	Production	•	•	•	•						
MM74C154	4 to 16 Line Decoder	Production	•	•	•	•						
MM74C157	Quad 2-Input Multiplexer	Production	•	•	•	•						
MM74C160	Sync Decade Counter	Production	•	•	•	•				MC14160B	40160B	SCL40160B
MM74C161	Sync Binary Counter	Production	•	•	•	•				MC14161B	40161B	SCL40161B
MM74C162	Fully Sync Decade Counter	Production	•	•	•	•				MC14162B	40162B	SCL40162B

MM74C165	8-Bit P-In—S-Out S/R	Production	•	•	•	•						
MM74C173	TRI-STATE Quad Flip-Flop	Production	•	•	•	•		•	CD4076B			
MM74C174	Hex D Flip-Flop	Production	•	•	•	•			CD40174B	MC14174B	40174B	
MM74C175	Quad D Flip-Flop	Production	•	•	•	•				MC14175B	40175B	
MM74C192	Sync Up/Down Decade Counter	Production	•	•	•	•			CD40192B		40192B	
MM74C193	Sync Up/Down Binary Counter	Production	•	•	•	•			CD40193B		40193B	
MM74C195	4-Bit Parallel S/R	Production	•	•	•	•					40195B	
MM74C200	256-Bit (256 x 1) RAM	Production	•			•		•				
MM74C221	Dual Monostable Multivibrator	Production	•	•	•	•						
MM74C240	Octal TRI-STATE Buffer	Production	•	•								
MM74C244	Octal TRI-STATE Buffer	Production	•	•								
MM74C373	Octal Flow-Through Latch TRI-STATE	Production	•	•								
MM74C374	Octal D Flip-Flop TRI-STATE	Production	•	•								
MM74C901	Hex Inverting Buffer (TTL Interface)	Production	•	•	•	•		•				
MM74C902	Hex Buffer (TTL Interface)	Production	•	•	•	•		•				
MM74C903	Hex Inverting Buffer (MOS Interface)	Production	•	•	•	•		•				
MM74C904	Hex Buffer (MOS Interface)	Production	•	•	•	•		•				
MM74C905	Successive Approximation Register	Production	•	•		•						
MM74C906	Open Drain Buffer (Active Pull-Down)	Production	•	•	•	•		•				
MM74C907	Open Drain Buffer (Active Pull-Up)	Production	•	•	•	•		•				
MM74C908	Dual – 30V Buffer	Production	•									
MM74C909	Linear Comparator	Production	•	•								
MM74C910	256-Bit (64 x 4) RAM	Production	•	•		•						
MM74C911	Display Controller 4-Digit, 8-Segments	Production	•	•								
MM74C912	Display Controller 6-Digit, 8-Segments	Production	•	•								
MM74C914	Hex Schmitt Trigger	Production	•	•	•	•						
MM74C915	7-Segment to BCD DecoDer	Production	•	•								
MM74C917	Display Controller, 6-Digit, 8-Segments, Hexadecimal	Production	•	•	•							

CMOS STATUS/CROSS REFERENCE GUIDE (Continued)

Product	Description	Status	Package			883	38510	Radiation Hardened	Equivalent Designations			
			N	J	W				RCA	Motorola	Fairchild	SSS
MM74C20	Dual 4-Input NAND Gate	Production	•	•	•	•						
MM74C30	8-Input NAND Gate	Production	•	•	•	•						
MM74C32	Quad 2-Input OR Gate	Production	•	•	•	•						
MM74C42	BCD-to-Decimal Decoder	Production	•	•	•	•						
MM74C48	BCD-to-7-Segment Decoder	Production	•	•	•	•						
MM74C73	Dual JK Flip-Flop	Production	•	•	•	•						
MM74C74	Dual D Flip-Flop	Production	•	•	•	•						
MM74C76	Dual JK Flip-Flop	Production	•	•	•	•						
MM74C83	4-Bit Binary Full Adder	Production	•	•	•	•						
MM74C85	4-Bit Comparator	Production	•	•	•	•					40085B	
MM74C86	Quad EX-OR Gate	Production	•	•	•	•		•	CD4070B	MC14507B		SCL4070B
MM74C89	64-Bit RAM	Production	•	•	•	•						
MM74C90	Decade Counter	Production	•	•	•	•						
MM74C93	4-Bit Binary Counter	Production	•	•	•	•						
MM74C95	4-Bit R-S L-S Register	Production	•	•	•	•						
MM74C107	Dual JK Flip-Flop	Production	•	•	•	•						
MM74C150	16 to 1 Multiplexer	Production	•	•	•	•						
MM74C151	8-Channel Digital Multiplexer	Production	•	•	•	•						
MM74C154	4 to 16 Line Decoder	Production	•	•	•	•						
MM74C157	Quad 2-Input Multiplexer	Production	•	•	•	•						
MM74C160	Sync Decade Counter	Production	•	•	•	•				MC14160B	40160B	SCL40160B
MM74C161	Sync Binary Counter	Production	•	•	•	•				MC14161B	40161B	SCL40161B
MM74C162	Fully Sync Decade Counter	Production	•	•	•	•				MC14162B	40162B	SCL40162B

MM74C173	TRI-STATE Quad Flip-Flop	Production	•	•	•	•			•	CD4076B			
MM74C174	Hex D Flip-Flop	Production	•	•	•	•				CD40174B	MC14174B	40174B	
MM74C175	Quad D Flip-Flop	Production	•	•	•	•					MC14175B	40175B	
MM74C192	Sync Up/Down Decade Counter	Production	•	•	•	•				CD40192B		40192B	
MM74C193	Sync Up/Down Binary Counter	Production	•	•	•	•				CD40193B		40193B	
MM74C195	4-Bit Parallel S/R	Production	•	•	•	•						40195B	
MM74C200	256-Bit (256 x 1) RAM	Production	•			•			•				
MM74C221	Dual Monostable Multivibrator	Production	•	•	•	•							
MM74C240	Octal TRI-STATE Buffer	Production	•	•									
MM74C244	Octal TRI-STATE Buffer	Production	•	•									
MM74C373	Octal Flow-Through Latch TRI-STATE	Production	•	•									
MM74C374	Octal D Flip-Flop TRI-STATE	Production	•	•									
MM74C901	Hex Inverting Buffer (TTL Interface)	Production	•	•	•	•			•				
MM74C902	Hex Buffer (TTL Interface)	Production	•	•	•	•			•				
MM74C903	Hex Inverting Buffer (MOS Interface)	Production	•	•	•	•			•				
MM74C904	Hex Buffer (MOS Interface)	Production	•	•	•	•			•				
MM74C905	Successive Approximation Register	Production	•	•		•							
MM74C906	Open Drain Buffer (Active Pull-Down)	Production	•	•	•	•			•				
MM74C907	Open Drain Buffer (Active Pull-Up)	Production	•	•	•	•			•				
MM74C908	Dual – 30V Buffer	Production	•										
MM74C909	Linear Comparator	Production	•	•									
MM74C910	256-Bit (64 x 4) RAM	Production	•	•		•							
MM74C911	Display Controller 4-Digit, 8-Segments	Production	•	•									
MM74C912	Display Controller 6-Digit, 8-Segments	Production	•	•									
MM74C914	Hex Schmitt Trigger	Production	•	•	•	•							
MM74C915	7-Segment to BCD DecoDer	Production	•	•									
MM74C917	Display Controller, 6-Digit, 8-Segments, Hexadecimal	Production	•	•	•								

DIGITAL INTERFACE CROSS REFERENCE GUIDE

AMD Device Designation	National Exact Replacement
0026	DS0026
0056	DS0056
1488	DS1488
1489(A)	DS1489(A)
AM26S10	DS26S10
AM26S11	DS26S11
AM26LS30	DS3691
AM26LS31	DS26LS31
AM26LS32	DS26LS32
AM26SL33	DS26LS33
DS3603	DS3603
DS3604	DS3604
DS3692	DS3692
SN7520	DS7520
SN7724	DS7524
SN75107	DS75107
SN75108	DS75108
SN75207	DS75207
SN75208	DS75208
SN75325	DS75325
8T26A	DS8T26A
8T28	DS8T28
8212	DP8212

Fairchild Device Designation	National Exact Replacement
75122	DS75122
75123	DS75123
75124	DS75124
75150	DS75150
75154	DS75154
75207	DS75207
75208	DS75208
75325	DS75325
75450	DS75450
75451	DS75451
75452	DS75452
75453	DS75453
75454	DS75454
75460	DS75460
75461	DS75461
75462	DS75462
75463	DS75463
75464	DS75464
75491	DS75491
75492	DS75492
μA8T13	DS75121
μA8T14	DS75122
μA8T23	DS75123

Motorola Device Designation	National Exact Replacement
MC26S11	DS26S11
MC3245	DS3245
MC3430	DS3651
MC3431	DS3651
MC3432	DS3653
MC3433	DS3653
MC3437	DS8837
MC3438	DS8838
MC3450	DS3650
MC3452	DS3652
MC3460	DS3674
MC3486	DS3486
MC3487	DS3487
MC6889	DS8T28
MC7520	DS7520
MC7522	DS7522
MC7524	DS7524
MC7528	DS7528
MC7534	DS7534
MC7538	DS7538
MC75107	DS75107
MC75108	DS75108
MC75325	DS75325

Signetics Device Designation	National Exact Replacement
DS3613	DS3613
DS3614	DS3614
7520	DS7520
7522	DS7522
7524	DS7524
7528	DS7528
75107	DS75107
75108	DS75108
75207	DS75207
75208	DS75208
75324	DS75324
75325	DS75325
75361	DS75361
75450	DS75450
75451	DS75451
75452	DS75452
75453	DS75453
75454	DS75454
N8T13	DS75121
N8T14	DS75122
N8T23	DS75123
N8T24	DS75124
N8T25	DS3625

8224	DP8224
8226	DP8226
8228	DP8228
8238	DP8238
DP8303	DP8303
DP8304B	DP8304B
DP8307	DP8307
DP8308	DP8308
DM8820(A)	DS8820(A)
DM8830	DS8830
DM8831	DS8831
DM8832	DS8832
DM8838	DS8838
9614	DS75114
9615	DS75115

Fairchild Device Designation	National Exact Replacement
μA1488	DS1488
μA1489(A)	DS1489(A)
3245	DS3245
7524	DS7524
7528	DS7528
75107	DS75107
75108	DS75108
75121	DS75121
9614	DS75114
9615	DS75115
9640	DS26S10
9641	DS26S11
9664	DS75492

Intel Device Designation	National Exact Replacement
3245	DS3245
8212	DP8212
8216	DP8216
8224	DP8224
8226	DP8226
8228	DP8228
8238	DP8238

Motorola Device Designation	National Exact Replacement
MMH0026C	DS0026C
MMH0056	DS0056C
MC1488	DS1488
MC1489(A)	DS1489(A)
MC26S10	DS26S10
MC75450	DS75450
MC75451	DS75451
MC75452	DS75452
MC75453	DS75453
MC75454	DS75454
MC75460	DS75460
MC75461	DS75461
MC75462	DS75462
MC75463	DS75463
MC75464	DS75464
MC75491	DS75491
MC75492	DS75492
MC8T13	DS75121
MC8T14	DS75122
MC8T23	DS75123
MC8T24	DS75124
MC8T26A	DS8T26A
MC8T28	DS8T28

Signetics Device Designation	National Exact Replacement
SP380	DS8640
MC1488	DS1488
MC1489(A)	DS1489(A)
DS3611	DS3611
DS3612	DS3612
N8T28	DS8T28
N8T34	DS8834
N8T37	DS8837
N8T38	DS8838
N8T51	DS8856
N8T59	DS8857
N8T380	DS8836
DM8820(A)	DS8820(A)
DM8830	DS8830
DM8880	DS8880

Texas Instruments Device Designation	National Exact Replacement
SN74S412	DP8212
SN74S428	DP8228
SN74S438	DP8238
SN7520	DS7520
SN7522	DS7522
SN7524	DS7524
SN7528	DS7528
SN7534	DS7534
SN7538	DS7538
SN75107	DS75107
SN75108	DS75108
SN75113	DS75113
SN75114	DS75114

DIGITAL INTERFACE CROSS REFERENCE GUIDE (Continued)

Texas Instruments Device Designation	National Exact Replacement
SN75115	DS75115
SN75121	DS75121
SN75122	DS75122
SN75123	DS75123
SN75124	DS75124
SN75125	DS75125
SN75127	DS75127
SN75128	DS75128
SN75129	DS75129
SN75150	DS75150
SN75154	DS75154

Texas Instruments Device Designation	National Exact Replacement
SN75180	DS8800
SN75182	DS8820
SN75183	DS8830
SN75188	DS1488
SN75189	DS1489
SN75207	DS75207
SN75208	DS75208
SN75322	DS75322
SN75324	DS75324
SN75325	DS75325
SN75361	DS75361

Texas Instruments Device Designation	National Exact Replacement
SN75362	DS75362
SN75364	DS75364
SN75365	DS75365
SN75369	DS0026
SN75450	DS75450
SN75451	DS75451
SN75452	DS75452
SN75453	DS75453
SN75454	DS75454
SN75460	DS75460
SN75461	DS75461

Texas Instruments Device Designation	National Exact Replacement
SN75462	DS75462
SN75463	DS75463
SN75464	DS75464
SN75480	DS8880
SN75484	DS8980
SN75491	DS75491
SN75492	DS75492
SN75493	DS75493
SN75494	DS75494

LOW POWER SCHOTTKY STATUS/CROSS REFERENCE GUIDE

Device	NSC	TI	SIG	FSC	Motorola	AMD
54/74LS00	X	X	X	X	X	
54/74LS01	X	X	X	X	0	
54/74LS02	X	X	X	X	X	
54/74LS03	X	X	X	X	X	
54/74LS04	X	X	X	X	X	
54/74LS05	X	X	X	X	X	

Device	NSC	TI	SIG	FSC	Motorola	AMD
54/74LS83A	X	X	X		X	
54/74LS85	X	X	X	X	X	
54/74LS86	X	X	X	X	X	
54/74LS90	X	X	X	X	X	
54/74LS91		X				
54/74LS92		X	X	X	X	

Device	NSC	TI	SIG	FSC	Motorola	AMD
54/74LS164	X	X	X	0	0	X
54/74LS165	0	X		0	0	
54/74LS166		X				
54/74LS168	X			X	0	X
54/74LS169	X			X	0	X
54/74LS170	X	X	X			0

| | | |

LOW POWER SCHOTTKY STATUS/CROSS REFERENCE GUIDE (Continued)

Device	NSC	TI	SIG	FSC	Motorola	AMD
54/74LS275		X				
54/74LS279	X	X	0	X	X	
54/74LS280		X		0	0	
54/74LS281		0				0
54/74LS283	X	X	X	0	0	
54/74LS289						
54/74LS290	X	X	X	X	X	
54/74LS293	X	X	X	X	X	
54/74LS295		X(B)	X	X	0	
54/74LS298		X	X	X	X	
54/74LS299		X	0	0	0	X
54/74LS322		X			0	X
54/74LS323		X	0		0	X
54/74LS324		X		0	0	
54/74LS325		X				
54/74LS326		X				
54/74LS327		X				
54/74LS347		X				
54/74LS348		X				
54/74LS352	X	X		0	0	
54/74LS353	X	X		0	0	
54/74LS362		X				
54/74LS363			0			

Device	NSC	TI	SIG	FSC	Motorola	AMD
54/74LS364			0			
54/74LS365	X	X	X	X	0	
54/74LS366	X	X	X	X	0	
54/74LS367	X	X	X	X	X	
54/74LS368	X	X	X	X	X	
54/74LS373	X	X	0	0	0	0
54/74LS374	X	X	0	0	0	X
54/74LS375		X	X	0	0	
54/74LS377		X	X	0	0	X
54/74LS378		X	0	0	0	X
54/74LS379		X	0	0	0	X
54/74LS381		0				X
54/74LS382						X
54/74LS384		X		0	0	X
54/74LS385		X		0	0	X
54/74LS386	X	X	X	0	0	
54/74LS388				0	0	X
54/74LS390		X	0	0	0	
54/74LS393		X	0	X	0	
54/74LS395(A)		X	0	X	0	
54/74SL396		X				
54/74LS398		X	0	0	0	
54/74LS399		X	0	0	0	X

Device	NSC	TI	SIG	FSC	Motorola	AMD
54/74LS424		X				X
54/74LS445		X	0			
54/74LS447		X				
54/74LS490		X	0	X	0	
54/74LS502				0	0	
54/74LS503				0	0	
54/74LS504				0	0	
54/74LS540				0	0	
54/74LS541				0	0	
54/74LS568				0	0	X
54/74LS569				0	0	X
54/74LS573				0	0	
54/74LS574				0	0	
54/74LS640		0				
54/74LS641		0				
54/74LS642		0				
54/74LS643		0				
54/74LS644		0				
54/74LS645		0				
54/74LS668		X				X
54/74LS669		X				X
54/74LS670	X	X	X	X		0

X = Released 0 = Planned

JFET SELECTION GUIDE

N-CHANNEL FETS

SWITCHES/CHOPPERS

Type No.	Case Style	BV_{GSS} BV_{GDO} (V) Min	@ I_G (μA)	I_{GSS} I_{DGO} (nA) Max	@ V_{DG} (V)	$I_{D(off)}$ (nA) Max	@ V_{DS} (V)	V_{GS} (V)	V_P (V) Min	Max	@ V_{DS} (V)	I_D (nA)	I_{DSS} (mA) Min	Max	@ V_{DS} (V)	$r_{ds(on)}$ (Ω) Max	@ I_D (mA)	C_{iss} (pF) Max	@ V_{DS} (V)	V_{GS} (V)	C_{rss} (pF) Max	@ V_{DS} (V)	V_{GS} (V)	t_{on} (ns) Max	t_{off} (ns) Max	Process No.	Pkg. No.
2N3824	TO-72	50	1	0.1	30	0.1	15	−8		8	15	0.1				250		6	15	0	3	0	−8			55	25
2N3966	TO-72	30	1	1	20	0.1	10	−7	4	6	10	10	2		20	220		6	20	0	1.5	0	−7			50	25
2N3970	TO-18	40	1	0.25*	20	0.25	20	−12	4	10	20	1	50	150	20	30	1	25	20	0	6	0	−12	20	30	51	02
2N3971	TO-18	40	1	0.25*	20	0.25	20	−12	2	5	20	1	25	75	20	60	1	25	20	0	6	0	−12	130	60	51	02
2N3972	TO-18	40	1	0.25*	20	0.25	20	−12	0.5	3	20	1	5	30	20	100	1	25	20	0	6	0	−12	80	100	51	02
• 2N4091	TO-18	40	1	0.2*	20	0.2	20	−12	5	10	20	1	30		20	30	1	16	20	0	5	0	−20	25	40	51	02
• 2N4092	TO-18	40	1	0.2*	20	0.2	20	−8	2	7	20	1	15		20	50	1	16	20	0	5	0	−20	35	60	51	02
• 2N4093	TO-18	40	1	0.2*	20	0.2	20	−6	1	5	20	1	8		20	80	1	16	20	0	5	0	−20	60	80	51	02
2N4391	TO-18	40	1	0.1	20	0.1	20	−12	4	10	20	1	50	150	20	30	1	14	20	0	3.5	0	−12	20	35	51	02
2N4392	TO-18	40	1	0.1	20	0.1	20	−7	2	5	20	1	25	75	20	60	1	14	20	0	3.5	0	−7	20	55	51	02
2N4393	TO-18	40	1	0.1	20	0.1	20	−5	0.5	3	20	1	5	30	20	100	1	14	20	0	3.5	0	−5	20	80	51	02
• 2N4856	TO-18	40	1	0.25	20	0.25	15	−10	4	10	15	0.5	50		15	25		18	0	−10	8	0	−10	9	25	51	02
2N856A	TO-18	40	1	0.25	20	0.25	15	−10	4	10	15	0.5	50		15	25		10	0	−10	4	0	−10	8	20	51	02
• 2N4857	TO-18	40	1	0.25	20	0.25	15	−10	2	6	15	0.5	20	100	15	40		18	0	−10	8	0	−10	10	50	51	02
2N4857A	TO-18	40	1	0.25	20	0.25	15	−10	2	6	15	0.5	20	100	15	40		10	0	−10	3.5	0	−10	10	40	51	02
• 2N4858	TO-18	40	1	0.25	20	0.25	15	−10	0.8	4	15	0.5	8	80	15	60		18	0	−10	8	0	−10	20	100	51	02
2N4858A	TO-18	40	1	0.25	20	0.25	15	−10	0.8	4	15	0.5	8	80	15	60		10	0	−10	3.5	0	−10	16	80	51	02

N-CHANNEL FETS (Continued)

SWITCHES/CHOPPERS (Continued)

Type No.	Case Style	BV_{GSS} BV_{GDO} (V) @ I_G (μA) Min		I_{GSS} (nA) @ V_{DG} Max	(V)	$I_{D(off)}$ (nA) @ V_{DS} Max	(V)	V_{GS} (V)	V_P (V) Min	Max	@ V_{DS} (V)	I_D (nA)	I_{DSS} (mA) @ Min	Max	V_{DS} (V)	$r_{ds(on)}$ (Ω) @ I_D Max	(mA)	C_{iss} (pF) @ V_{DS} Max	(V)	V_{GS} (V)	C_{rss} (pF) @ V_{DS} Max	(V)	V_{GS} (V)	t_{on} (ns) Max	t_{off} (ns) Max	Process No.	Pkg. No.
• 2N4859	TO-18	30	1	0.25	15	0.25	15	– 10	4	10	15	0.5	50		15	25		18	0	– 10	8	0	– 10	9	25	51	02
2N4859A	TO-18	30	1	0.25	15	0.25	15	– 10	4	10	15	0.5	50		15	25		10	0	– 10	4	0	– 10	8	20	51	02
• 2N4860	TO-18	30	1	0.25	15	0.25	15	– 10	2	6	15	0.5	20	100	15	40		18	0	– 10	8	0	– 10	10	50	51	02
2N4860A	TO-18	30	1	0.25	15	0.25	15	– 10	2	6	15	0.5	20	100	15	40		10	0	– 10	3.5	0	– 10	10	40	51	02
• 2N4861	TO-18	30	1	0.25	15	0.25	15	– 10	0.8	4	15	0.5	8	80	15	60		18	0	– 10	8	0	– 10	20	100	51	02
2N4861A	TO-18	30	1	0.25	15	0.25	15	– 10	0.8	4	15	0.5	8	80	15	60		10	0	– 10	3.5	0	– 10	16	80	51	02
2N5432	TO-52	25	1	0.2	15	0.2	5	– 10	4	10	5	3	150		15	5	10	30	0	– 10	15	0	– 10	5	36	58	07
2N5433	TO-52	25	1	0.2	15	0.2	5	– 10	3	9	5	3	100		15	7	10	30	0	– 10	15	0	– 10	5	36	58	07
2N5434	TO-52	25	1	0.2	15	0.2	5	– 10	1	4	5	3	30		15	10	10	30	0	– 10	15	0	– 10	5	36	58	07
2N5555	TO-92	25	10	1	15	10	12	– 10		(10)			15		15	150		5	15	0	1.2	0	– 10	10	25	50	72
2N5638	TO-92	30	10	1	15	1	15	– 12		(12)			50		20	30	1	10	0	– 12	4	0	– 12			51	72
2N5639	TO-92	30	10	1	15	1	15	– 8		(8)			25		20	60	1	10	0	– 12	4	0	– 8			51	72
2N5640	TO-92	30	10	1	15	1	15	– 6		(6)			5		20	100	1	10	0	– 12	4	0	– 6			51	72
2N5653	TO-92	30	10	1	15	1	15	– 12		(12)			40		20	50	1	10	0	– 12	3.5	0	– 12	9	15	51	72
2N5654	TO-92	25	10	1	15	10	15	– 8		(8)			15		20	100	1	10	0	– 12	3.5	0	– 8	14	30	51	72
J108	TO-92	25	1	3	15	3	5	– 10	3	10	5	1000	80		15	8	10	t30	0	– 10	t15	0	– 10	t5	t36	58	72
J109	TO-92	25	1	3	15	3	5	– 10	2	6	5	1000	40		15	12	10	t30	0	– 10	t15	0	– 10	t5	t36	58	72
J110	TO-92	25	1	3	15	3	5	– 10	0.5	4	5	1000	10		15	18	10	t30	0	– 10	t15	0	– 10	t5	t36	58	72

J112	TO-92	35	1	1	15	1	5	−10	1	5	5	1000	5		15	50	1	t10	0	−10	t5	0	−10	t13	t35	51	72
J113	TO-92	35	1	1	15	1	5	−10	0.5	3	5	1000	2		15	100	1	t10	0	−10	t5	0	−10	t13	t35	51	72
J114	TO-92	25	1	1	15	1	5	−10	3	10	5	1000	15		15	150	1	t4	0	−10	t2	0	−10	t6	t20	90	72
PN4091	TO-92	40	1	1°	20	1	20	−12	5	10	20	1	30		20	30		16	20	0	5	20	0	25	40	51	72
PN4092	TO-92	40	1	1°	20	1	20	−8	2	7	20	1	15		20	50		16	20	0	5	20	0	35	60	51	72
PN4093	TO-92	40	1	1°	20	1	20	−6	1	5	20	1	8		20	80		16	20	0	5	20	0	60	80	51	72
PN4391	TO-92	40	1	1	20	1	20	−12	4	10	20	1	50	150	20	30		14	20	0	3.5	0	−12	20	35	51	72
PN4392	TO-92	40	1	1	20	1	20	−7	2	5	20	1	25	75	20	60		14	20	0	3.5	0	−7	40	80	51	72
PN4393	TO-92	40	1	1	20	1	20	−5	0.5	3	20	1	5	30	20	100		14	20	0	3.5	0	−5	55	130	51	72
PN4856	TO-92	40	1	1	20	1	15	−10	4	10	15	0.5	50		15	25		18	0	−10	8	0	−10	9	25	51	72
PN4857	TO-92	40	1	1	20	1	15	−10	2	6	15	0.5	20	100	15	40		18	0	−10	8	0	−10	10	50	51	72
PN4858	TO-92	40	1	1	20	1	15	−10	0.8	4	15	0.5	8	80	15	60		18	0	−10	8	0	−10	20	100	51	72
PN4859	TO-92	30	1	1	15	1	15	−10	4	10	15	0.5	50		15	25		18	0	−10	8	0	−10	9	25	51	72
PN4860	TO-92	30	1	1	15	1	15	−10	2	6	15	0.5	20	100	15	40		18	0	−10	8	0	−10	10	50	51	72
PN4861	TO-92	30	1	1	15	1	15	−10	0.8	4	15	0.5	8	80	15	60		18	0	−10	8	0	−10	20	100	51	72
TIS73	TO-92	30	1	2	15	2	15	−10	4	10	15	4	50		15	25		18	0	−10	8	0	−10	9	25	51	77
TIS74	TO-92	30	1	2	15	2	15	−10	2	6	15	4	20	100	15	40		18	0	−10	8	0	−10	10	50	51	77
TIS75	TO-92	30	1	2	15	2	15	−10	0.8	4	15	4	8	80	15	60		18	0	−10	8	0	−10	20	100	51	77
U1897E	TO-92	40	1	0.2*	20				5	10	20	1	30		20	30	1	16	20	0	5	0	−20	25	40	51	72
U1898E	TO-92	40	1	0.2*	20				2	7	20	1	15		20	50	1	16	20	0	5	0	−20	35	60	51	72
U1899E	TO-92	40	1	0.2*	20				1	5	20	1	8		20	80	1	16	20	0	5	0	−20	60	80	51	72

• **Note:** JAN qualified per applicable MIL-S-19500 specification.
t = typical value.

N-CHANNEL FETS (Continued)

RF, VHF, UHF AMPLIFIERS

Type No.	Case Style	BV_{GSS} (V) @ I_G Min	(μA)	I_{GSS} (nA)@V_{DG} Max	(V)	V_p (V) Min	Max	@ V_{DS} (V)	I_D (nA)	I_{DSS} (mA) @ Min	Max	V_{DS} (V)	$R_e\|Y_{fs}\|$ (mmho)@ Freq Min	(MHz)	$R_e(Y_{os})$ (μmho) @ f Max	(MHz)	C_{iss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	C_{rss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	NF (dB)@R_G = 1k Max	Freq (MHz)	Process No.	Pkg. No.
2N3819	TO-92	25	1	2	15		8	15	2	2	20	15	1.6	100			8	15	0	−4	15	0			50	74
2N3823	TO-72	30	1	0.5	20		8	15	0.5	4	20	15	3.2	200	200	200	6	15	0	−2	15	0	2.5	100	50	25
2N4223	TO-72	30	10	0.25	20	0.1	8	15	0.25	3	18	15	2.7	200	200	200	6	15	0	−2	15	0	5	200	50	25
2N4224	TO-72	30	10	0.5	20	0.1	8	15	0.5	2	20	15	1.7	200	200	200	6	15	0	2	15	0			50	25
2N4416	TO-72	30	1	0.1	20		6	15	1	5	15	15	4	400	100	400	4	15	0	0.8	15	0	4	400	50	25
• 2N4416A	TO-72	35	1	0.1	20	2.5	6	15	1	5	15	15	4	400	100	400	4	15	0	0.8	15	0	4	400	50	25
2N5078	TO-72	30	1	0.25	20	0.5	8	15		4	25	15	4	200	150	200	6	15	0	2	15	0	3	200	50	25
2N5245	TO-92	30	1	1	20	1	6	15	10	5	15	15	4	400	100	400	4.5	15	0	1	15	0	4	400	90	77
2N5246	TO-92	30	1	1	20	0.5	4	15	10	1.5	7	15	2.5	400	100	400	4.5	15	0	1	15	0			90	77
2N5247	TO-92	30	1	1	20	1.5	8	15	10	8	24	15	4	400	150	400	4.5	15	0	1	15	0			90	77
2N5248	TO-92	30	1	5	20	1	8	15	10	4	20	15	3	200	200	200	6	15	0	2	15	0			50	74
2N5397	TO-72	25	1	0.1	15	1	6	10	1	10	30	10	5.5	450	200	450	5	10	10 mA	1.2	10	10 mA	3.5	450	90	29
2N5398	TO-72	25	1	0.1	15	1	6	10	1	5	40	10	5.0	450	400	450	5.5	10	0	1.3	10	0	3.2	450	90	29
2N5484	TO-92	25	1	1	20	0.3	3	15	10	1	5	15	2.5	100	75	100	5	15	0	1	15	0	3	100	50	72
2N5485	TO-92	25	1	1	20	1	4	15	10	4	10	15	3	400	100	400	5	15	0	1	15	0	4	400	50	72
2N5486	TO-92	25	1	1	20	2	6	15	10	8	20	15	3.5	400	100	400	5	15	0	1	15	0	4	400	50	72
2N5668	TO-92	25	10	2	15	0.2	4	14	10	1	5	15	1	100	50	100	7	15	0	3	15	0	2.5	100	50	72

2N5950	TO-92	30	1	1	15	2.5	6	15	100	10	15	15	3.0	100	75	100	6	15	0	2	15	0	5	100	50	77
2N5951	TO-92	30	1	1	15	2	5	15	100	7	13	15	3.0	100	75	100	6	15	0	2	15	0	5	100	50	77
2N5952	TO-92	30	1	1	15	1.3	3.5	15	100	4	8	15	1.0	100	75	100	6	15	0	2	15	0	5	100	50	77
2N5953	TO-92	30	1	1	15	0.8	3	15	100	2.5	5	15	1.0	100	50	100	6	15	0	2	15	0	5	100	50	77
J300	TO-92	25	1	0.5	15	1	6	10	1	6	30	10	4.5	0.001	200	0.001	5.5	10	5 mA	1.7	10	5 mA	t2	100	90	72
J304	TO-92	30	1	0.1	20	2	6	15	1	5	15	15	t4.2	400	t80	100	t3	15	0	t.8	15	0	t4	400	50	72
J305	TO-92	30	1	0.1	20	0.5	3	15	1	1	8	15	t3.0	400	t80	100	t3	15	0	t.8	15	0	t4	400	50	72
J308	TO-92	25	1	1	15	1	6.5	10	1	12	60	10	8	0.001	200	0.001	7.5	0	−10	2.5	0	−10	t1.5	100	92	72
J309	TO-92	25	1	1	15	1	4.0	10	1	12	30	10	10	0.001	200	0.001	7.5	0	−10	2.5	0	−10	t1.5	100	92	72
J310	TO-92	25	1	1	15	2	6.5	10	1	24	60	10	8	0.001	200	0.001	7.5	0	−10	2.5	0	−10	t1.5	100	91	72
MPF102	TO-92	25	1	2	15		8	15	2	2	20	15	1.6	100	100	200	7	15	0	3	15	0			50	72
MPF106	TO-92	25	1	1	20	0.5	4	15	0.5	4	10	15	2.5	0.001			5	15	0	2	15	0	4	400	50	72
MPF107	TO-92	25	1	1	20	2	6	15	0.5	8	20	15	4	0.001			5	15	0	1.2	15	0	4	400	50	72
MPF108	TO-92	25	10	1	15	0.5	8	15	10	1.5	24	15	1.6	100	200	100	6.5	15	0	2.5	15	0	3	100	50	72
PN4223	TO-92	30	1	0.25	20	0.1	8	15	1	3	18	15	2.7	200	200	200	6	15	0	2	15	0	5	200	50	72
PN4224	TO-92	30	1	0.5	20	0.1	8	15	5	2	20	15	1.7	200	200	200	6	15	0	2	15	0			50	72
PN4416	TO-92	30	1	0.1	20		6	15	1	5	15	15	4	400	100	400	4	15	0	0.8	15	0	4	400	50	72
U308	TO-52	25	1	0.15	15	1	6	10	1	12	60	10	10	0.001	150	100	5	0	10 mA	2.5	0	10 mA	t3	450	92	07
U309	TO-52	25	1	0.15	15	1	4	10	1	12	30	10	10	0.001	150	100	5	0	10 mA	2.5	0	10 mA	t3	450	92	07
U310	TO-52	25	1	0.15	15	2.5	6	10	1	24	60	10	10	0.001	150	100	5	10	10 mA	2.5	10	10 mA	t3	450	92	07
U312	TO-52	25	1	0.1	15	1	6	10	1	10	30	10	6	0.001			3.8	10	10 mA	1.2	10	10 mA	t3.5	450	90	07

N-CHANNEL FETS (Continued)

RF, VHF, UHF AMPLIFIERS (Continued)

Type No.	Case Style	BV_{GSS} BV_{GDO} (V) @ I_G (μA) Min		I_{GSS} (nA)@V_{DG} Max	(V)	V_P (V) Min	Max	@ V_{DS} (V)	I_D (nA)	I_{DSS} (mA) @ Min	Max	V_{DS} (V)	$R_e\|Y_{fs}\|$ (mmho)@Freq Min	(MHz)	$R_e(Y_{os})$ (μmho) @ f Max	(MHz)	C_{iss} (pF)@V_{DS} (V) Max		V_{GS} (V)	C_{rss} (pF)@V_{DS} (V) Max		V_{GS} (V)	NF (dB)@R_G = 1k Max	Freq (MHz)	Process No.	Pkg. No.
U320	TO-39	20	1	3	15	2	10	5	1 mA	100	500	15	75	0.001			30	0	−10	15	0	−10	t2.5	30	58	09
U321	TO-39	25	1	3	15	1	4	5	1 mA	80	250	15	75	0.001			30	0	−10	15	0	−10	t2.5	30	58	09
U322	TO-39	25	1	3	15	3	10	5	1 mA	200	700	15	75	0.001			30	0	−10	15	0	−10	t2.5	30	58	09

• **Note:** JAN Qualified per applicable MIL-S-19500 specification
t = typical value.

LOW FREQUENCY — LOW NOISE AMPLIFIERS

Type No.	Case Style	BV_{GSS} (V) Min	I_G (μA)	I_{GSS} (nA) Max	V_{DG} (V)	$V_{GS(off)}$ (V) Min	Max	V_{DS} (V)	I_D (nA)	I_{DSS} (mA) Min	Max	V_{DS} (V)	g_{fs} (Re|Y_{fs}|) (mmho) Min	Max	V_{DS} (V)	f (MHz)	G_{oss} (μmho) Max	V_{DS} (V)	C_{iss} (pF) Max	V_{DS} (V)	V_{GS} (V)	C_{rss} (pF) Max	V_{DS} (V)	e_n nV/√Hz@f Max	(Hz)	Process No.	Pkg. No.
2N4393	TO-18	40	1.0	0.1	20	0.5	3.0	20	1.0	5	30	20	t12		20	0.001			14	20	0	3.5	5 (GS)	t8	10	51	02
2N5556	TO-72	30	10	0.1	15	0.2	4.0	15	1.0	0.5	2.5	15	1.5	6.5	15	0.001	20	15	6	15	0	3	15	35	10	50	25
2N5557	TO-72	30	10	0.1	15	0.8	5.0	15	1.0	2	5.0	15	1.5	6.5	15	0.001	20	15	6	15	0	3	15	35	10	50	25
2N5558	TO-72	30	10	0.1	15	1.5	6.0	15	1.0	4	10	15	1.5	6.5	15	0.001	20	15	6	15	0	3	15	35	10	50	25
NF5101	TO-72	40	1	0.2	15	0.5	1.1	15	1.0	1	12	15	3.5		15	0.001	25	15	t12	15	0	t4	15	3.5	1000	51	25

PF5102	TO-92	40	1	0.2	15	0.7	1.6	15	1.0	4	20	15	7.5	15	0.001	25	15	t12	15	0	t4	15	3.5	1000	51	72
PF5103	TO-92	40	1	0.2	15	1.2	2.7	15	1.0	10	40	15	7.5	15	0.001	25	15	t12	15	0	t4	15	3.5	1000	51	72
PN4393	TO-92	40	1.0	0.1	20	0.5	3.0	20	1.0	5	30	20	t12	20	0.001			14	20	0	3.5	5 (GS)	t8	10	51	72

ULTRA LOW INPUT CURRENT AMPS

Transistor Type	Case Style	BV_{GSS} (V) @ I_G		I_{GSS} (pA) @ V_{DG}		V_P (V)		@ V_{DS}	I_D	I_{DSS} (μA) @ V_{DS}			G_{fs} (μmho) @ V_{DS}			G_{oss} (μmho) V_{DS}		C_{iss} (pF) @ V_{DS}		V_{GS}	C_{rss} (pF) @ V_{DS}		V_{GS}	Process No.	Pkg. No.
		Min	(μA)	Max	(V)	Min	Max	(V)	(nA)	Min	Max	(V)	Min	Max	(V)	Max	(V)	Max	(V)	(V)	Max	(V)	(V)		
2N4117	TO-72	40	1	10	20	0.6	1.8	10	1	30	90	10	20	210	10	3	10	3	10	0	1.5	10	0	53	25
2N4117A	TO-72	40	1	1	20	0.6	1.8	10	1	30	90	10	70	210	10	3	10	3	10	0	1.5	10	0	53	25
2N4118	TO-72	40	1	10	20	1	3	10	1	80	240	10	80	250	10	5	10	3	10	0	1.5	10	0	53	25
2N4118A	TO-72	40	1	1	20	1	3	10	1	80	240	10	80	250	10	5	10	3	10	0	1.5	10	0	53	25
2N4119	TO-72	40	1	10	20	2	6	10	1	200	600	10	100	330	10	10	10	3	10	0	1.5	10	0	53	25
2N4119A	TO-72	40	1	1	20	2	6	10	1	200	600	10	100	330	10	10	10	3	10	0	1.5	10	0	53	25
NF5301	TO-72	30	1	1	15	0.6	3	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	25
NF5301-1	TO-72	30	1	1	15	0.6	1.8	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	25
NF5301-2	TO-72	30	1	1	15	1.7	3	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	25
NF5301-3	TO-72	30	1	1	15	1.0	2.4	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	25
PF5301	TO-92	30	1	1	15	0.6	3	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	72

N-CHANNEL FETS (Continued)

ULTRA LOW INPUT CURRENT AMPS (Continued)

Transistor Type	Case Style	BV_{GSS} BV_{GDO} (V) @ I_G (μA) Min	I_{GSS} (pA) @ V_{DG} Max	(V)	V_P (V) @ V_{DS} (V) Min	Max		I_D (nA)	I_{DSS} (μA) @ V_{DS} (V) Min	Max		G_{fs} (μmho) @ V_{DS} (V) Min	Max		G_{oss} (μmho) @ V_{DS} (V) Max		C_{iss} (pF) @ V_{DS} (V) @ V_{GS} (V) Max			C_{rss} (pF) @ V_{DS} (V) @ V_{GS} (V) Max			Process No.	Pkg. No.
PF5301-1	TO-92	30	1	1	15	0.6	1.8	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	72
PF5301-2	TO-92	30	1	1	15	1.7	3	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	72
PF5301-3	TO-92	30	1	1	15	1.0	3.4	10	1	30	500	10	70	300	10			3	10	0	1.5	10	0	53	72
PN4117	TO-92	40	1	10	20	0.6	2.8	10	1	30	90	10	20	210	10	3	10	3	10	0	1.5	10	0	53	72
PN4117A	TO-92	40	1	1	20	0.6	2.8	10	1	30	90	10	70	210	10	3	10	3	10	0	1.5	10	0	53	72
PN4118	TO-92	40	1	10	20	1	3	10	1	80	240	10	80	250	10	5	10	3	10	0	1.5	10	0	53	72
PN4118A	TO-92	40	1	1	20	1	3	10	1	80	240	10	80	250	10	5	10	3	10	0	1.5	10	0	53	72
PN4119	TO-92	40	1	10	20	2	6	10	1	200	600	10	100	330	10	10	10	3	10	0	1.5	10	0	53	72
PN4119A	TO-92	40	1	1	20	2	6	10	1	200	600	10	100	330	10	10	10	3	10	0	1.5	10	0	53	72

Transistor Type	Case Style	BV_{GSS} *BV_{GDO} (V) Min	I_G (μA)	I_{GSS} (nA)@V_{DG} Max	V_{DG} (V)	V_p (V) Min	V_p (V) Max	@ V_{DS} (V)	I_D (nA)	I_{DSS} (mA) Min	I_{DSS} (mA) Max	@ V_{DS} (V)	G_{fs} (mmho) Min	G_{fs} (mmho) Max	@ V_{DS} (V)	G_{oss} (μmho)@V_{DS} Max	(V)	C_{iss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	C_{rss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	e_n $\left(\frac{NV}{\sqrt{Hz}}\right)$ Max	@ Freq (Hz)		Process No.	Pkg. No.
2N3369	TO-18	*40	1	5	30		6.5	20	1000	0.5	2.5	30	0.6	2.5	30	30	30	20	8	0	3	30	0				52	02
2N3370	TO-18	*40	1	5	30		3.2	20	1000	0.1	0.6	30	0.3	2.5	30	15	30	20	8	0	3	30	0				52	02
2N3436	TO-18	*50	1	0.5	30		9.8	20	1000	3	15	20	2.5	10	20	35	30	18	0	−10	6	30	0	100	1000	55	02
2N3437	TO-18	*50	1	0.5	30		4.8	20	1000	0.8	4	20	1.5	6	20	20	30	18	0	−6	6	30	0	100	1000	55	02
2N3438	TO-18	*50	1	0.5	30		2.3	20	1000	0.2	1	20	0.8	4.5	20	5	30	18	0	−4	6	30	0	100	1000	55	02
2N3458	TO-18	*50	1	0.25	30		7.8	20	1000	3	15	20	2.5	10	20	35	30	18	0	−10	5	30	0	225	20	52	02
2N3459	TO-18	*50	1	0.25	30		3.4	20	1000	0.8	4	20	1.5	6	20	20	30	18	0	−6	5	30	0	155	20	52	02
2N3460	TO-18	*50	1	0.25	30		1.8	20	1000	0.2	1	20	0.8	4.5	20	5	30	18	0	−4	5	30	0	155	20	52	02
2N3684	TO-72	50	1	0.1	30	2	5	20	1	2.5	7.5	20	2	3	20	50	20	4	20	0	1.2	20	0	150	100	52	25
2N3685	TO-72	50	1	0.1	30	1	3.5	20	1	1	3	20	1.5	2.5	20	25	20	4	20	0	1.2	20	0	150	100	52	25
2N3686	TO-72	50	1	0.1	30	0.6	2	20	1	0.4	1.2	20	1	2	20	10	20	4	20	0	1.2	20	0	150	100	52	25
2N3687	TO-72	50	1	0.1	30	0.3	1.2	20	1	0.1	0.5	20	0.5	1.5	20	5	20	4	20	0	1.2	20	0	150	100	52	25
2N3821	TO-72	50	1	0.1	30		4	15	0.5	0.5	2.5	15	1.5	4.5	15	10	15	6	15	0	3	15	0	200	10	55	25
2N3822	TO-72	50	1	0.1	30		6	15	0.5	2	10	15	3	6.5	15	20	15	6	15	0	3	15	0	200	10	55	25
2N3967	TO-72	30	1	0.1	20	2	5	20	1	2.5	10	20	2.5		20	35	20¶	5	20	¶	1.3	20	■	84	100	50	25
2N3967A	TO-72	30	1	0.1	20	2	5	20	1	2.5	10	20	2.5		20	35	20¶	5	20	¶	1.3	20	■	160	10	50	25
2N3968	TO-72	30	1	0.1	20		3	20	1	1	5	20	2		20	15	20**	5	20	**	1.3	20	†	84	100	50	25

N-CHANNEL FETS (Continued)

GENERAL PURPOSE AMPS (Continued)

Transistor Type	Case Style	BV_{GSS} *BV_{GDO} (V) @ I_G (μA) Min		I_{GSS} (nA)@V_{DG} Max	(V)	V_P (V) Min	Max	@ V_{DS} (V)	I_D (nA)	I_{DSS} (mA) @ V_{DS} Min	Max	(V)	G_{fs} (mmho) @ V_{DS} Min	Max	(V)	G_{oss} (μmho)@V_{DS} Max	(V)	C_{iss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	C_{rss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	e_n $\left(\frac{NV}{\sqrt{Hz}}\right)$ @ Max	Freq (Hz)	Process No.	Pkg. No.
2N3968A	TO-72	30	1	0.1	20		3	20	1	1	5	20	2		20	15	20**	5	20	**	1.3	20	†	160	10	50	25
2N3969	TO-72	30	1	0.1	20		1.7	20	1	0.4	2	20	1.3		20	5	20††	5	20	††	1.3	20	¶	84	100	50	25
2N3969A	TO-72	30	1	0.1	20		1.7	20	1	0.4	2	20	1.3		20	5	20††	5	20	††	1.3	20	¶	160	10	50	25
2N4220	TO-72	30	10	0.1	15		4	15	0.1	0.5	3	15	1	4	15	10	15	6	15	0	2	15	0			55	25
2N4220A	TO-72	30	10	0.1	15		4	15	0.1	0.5	3	15	1	4	15	10	15	6	15	0	2	15	0	115	100	55	25
2N4221	TO-72	30	10	0.1	15		6	15	0.1	2	6	15	2	5	15	20	15	6	15	0	2	15	0			55	25
2N4221A	TO-72	30	10	0.1	15		6	15	0.1	2	6	15	2	5	15	20	15	6	15	0	2	15	0	115	100	55	25
2N4222	TO-72	30	10	0.1	15		8	15	0.1	5	15	15	2.5	6	15	40	15	6	15	0	2	15	0			55	25
2N4222A	TO-72	30	10	0.1	15		8	15	0.1	5	15	15	2.5	6	15	40	15	6	15	0	2	15	0	115	100	55	25
2N4338	TO-18	50	1	0.1	30	0.3	1	15	100	0.2	0.6	15	0.6	1.8	15	5	15	7	15	0	3	15	0	68	1000	52	02
2N4339	TO-18	50	1	0.1	30	0.6	1.8	15	100	0.5	1.5	15	0.8	2.4	15	15	15	7	15	0	3	15	0	68	1000	52	02
2N4340	TO-18	50	1	0.1	30	1	3	15	100	1.2	3.6	15	1.3	3	15	30	15	7	15	0	3	15	0	68	1000	52	02
2N4341	TO-18	50	1	0.1	30	2	6	15	100	3	9	15	2	4	15	60	15	7	15	0	3	15	0	68	1000	55	02
2N5103	TO-72	25	10	0.1	15	0.5	4	15	1	1	8	15	2	8	15	100	15	5	15	0	1	15	0	100	10	50	25
2N5104	TO-72	25	1	0.1	15	0.5	4	15	1	2	6	15	3.5	7.5	15	100	15	5	15	0	1	15	0	50	10	50	25
2N5105	TO-72	25	1	0.1	15	0.5	4	15	1	5	15	15	5	10	15	100	15	5	15	0	1	15	0			50	25
2N5358	TO-72	40	1	0.1	20	0.5	3	15	100	0.5	1	15	1	3	15	10	15	6	15	0	2	15	0	115	100	55	25

2N5362	TO-72	40	1	0.1	20	2	7	15	100	4	8	15	2	5.5	15	40	15	6	15	0	2	15	0	115	100	55	25
2N5363	TO-72	40	1	0.1	20	2.5	8	15	100	7	14	15	2.5	6	15	40	15	6	15	0	2	15	0	115	100	55	25
2N5364	TO-72	40	1	0.1	20	2.5	8	15	100	9	18	15	2.7	6.5	15	60	15	6	15	0	2	15	0	115	100	55	25
2N5457	TO-92	25	1	1	15	0.5	6	15	10	1	5	15	2	5	15	50	15	7	15	0	3	15	0			55	72
2N5458	TO-92	25	1	1	15	1	7	15	10	2	9	15	1.5	5.5	15	50	15	7	15	0	3	15	0			55	72
2N5459	TO-92	25	1	1	15	2	8	15	10	4	16	15	2	6	15	50	15	7	15	0	3	15	0			55	72
2N5556	TO-72	30	1	0.1	15	0.2	4	15	1	0.5	2.5	15	1.5	6.5	15	20	15	6	15	0	3	15	0	35	10	50	25
2N5557	TO-72	30	1	0.1	15	0.8	5	15	1	2	5	15	1.5	6.5	15	20	15	6	15	0	3	15	0	35	10	50	25
2N5558	TO-72	30	1	0.1	15	1.5	6	15	1	4	10	15	1.5	6.5	15	20	15	6	15	0	3	15	0	35	10	50	25
J201	TO-92	40	1	0.1	20	0.3	1.5	20	10	0.2	1	20	0.5		20	t1	20	t5	20	0	t2	20	0	t10	1000	52	72
J202	TO-92	40	1	0.1	20	0.8	4	20	10	0.9	4.5	20	1		20	t3.5	20	t5	20	0	t2	20	0	t10	1000	52	72
J203	TO-92	40	1	0.1	20	2	10	20	10	4	20	20	1.5		20	t10	20	t5	20	0	t2	20	0	t10	1000	52	72
J210	TO-92	25	1	0.1	15	1	3	15	1	2	15	15	4	12	15	150	15	t5	15	0	t1.5	15	0	t10	1000	90	72
J211	TO-92	25	1	0.1	15	2.5	4.5	15	1	7	20	15	7	12	15	200	15	t5	15	0	t1.5	15	0	t10	1000	90	72
J212	TO-92	25	1	0.1	15	4	6	15	1	15	40	15	7	12	15	200	15	t5	15	0	t1.5	15	0	t10	1000	90	72
MPF103	TO-92	25	1	1	15		6	15	1	1	5	15	1	5	15	50	15	7	15	0	3	15	0			55	72
MPF104	TO-92	25	1	1	15		7	15	1	2	9	15	1.5	5.5	15	50	15	7	15	0	3	15	0			55	72
MPF105	TO-92	25	1	1	15		8	15	1	4	16	15	2	6	15	50	15	7	15	0	3	15	0			55	72
MPF109	TO-92	25	10	1	15	0.2	8	15	10	0.5	24	15	0.8	6	15	75	15	7	15	0	3	15	0	115	1000	55	72
MPF111	TO-92	20	10	100	10	0.5	10	10	1000	0.5	20	10	0.5		10	200	10									50	72
MPF112	TO-92	25	10	100	10	0.5	10	10	1000	1	25	10	1	7.5	10											55	72

N-CHANNEL FETS (Continued)

GENERAL PURPOSE AMPS (Continued)

Transistor Type	Case Style	BV_{GSS} *BV_{GDO} (V) @ I_G (μA) Min		I_{GSS} (nA)@V_{DG} Max	(V)	V_p (V) Min	Max	@ V_{DS} (V)	I_D (nA)	I_{DSS} (mA) @ V_{DS} Min	Max	(V)	G_{fs} (mmho) @ V_{DS} Min	Max	(V)	G_{oss} (μmho)@V_{DS} Max	(V)	C_{iss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	C_{rss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	e_n $\left(\frac{NV}{\sqrt{Hz}}\right)$ Max	@ Freq (Hz)	Process No.	Pkg. No.
PN3684	TO-92	50	1	0.1	30	2	5	20	1	2.5	7.5	20	2	3	20	50	20	4	20	0	1.2	20	0	150	20	52	72
PN3685	TO-92	50	1	0.1	30	1	3.5	20	1	1	3	20	1.5	2.5	20	25	20	4	20	0	1.2	20	0	150	20	52	72
PN3686	TO-92	50	1	0.1	30	0.6	2	20	1	0.4	1.2	20	1	2	20	10	20	4	20	0	1.2	20	0	150	20	52	72
PN3687	TO-92	50	1	0.1	30	0.3	1.2	20	1	0.1	0.5	20	0.5	1.5	20	5	20	4	20	0	1.2	20	0	150	20	52	72
PN4220	TO-92	30	10	1	15		4	15	1	0.5	3	15	1	4	15	10	15	6	15	0	2	15	0			55	72
PN4221	TO-92	30	10	1	15		6	15	1	2	6	15	2	5	15	20	15	6	15	0	2	15	0			55	72
PN4222	TO-92	30	10	1	15		8	15	1	5	15	15	2.5	6	15	40	15	6	15	0	2	15	0			55	72
PN4302	TO-92	30	1	1	10		4	20	10	0.5	5	20	1		20	50	20	6	20	0	3	20	0	100	1000	52	72
PN4303	TO-92	30	1	1	10		6	20	10	4	10	20	2		20	50	20	6	20	0	3	20	0	100	1000	52	72
PN4304	TO-92	30	1	1	10		10	20	10	0.5	15	20	1		20	50	20	6	20	0	3	20	0	125	1000	52	72
PN5163	TO-92	25	1	10	15	0.4	8	15	1000	1	40	15	2	9	15	200	15	12	15	0	3	15	0	50	1000	50	72
TIS58	TO-92	25	1	4	15	0.5	5	15	20	2.5	8	15	1.3	4	15			6	15	2 mA	3	15	2 mA			50	74
TIS-59	TO-92	25	1	4	15	1	9	15	20	6	25	15	1.3		15			6	15	2 mA	3	15	2 mA			50	74

■ I_D = 1 mA; † I_D = 500 μA; †† I_D = 40 μA; •• I_D = 100 μA; ¶5 I_D = 250 μA.
t = typical value.

Type No.	Case Style	Operating Conditions For These Characteristics: Op. Char. V_{DG} (V)	Op. Char. I_D (μA)	$\lvert V_{GS1-2}\rvert$ V_{OS} Max (mV)	Drift (μV/°C) ΔV_{GS} Max	I_G Max (pA)	G_{fs} μmhoe Min	G_{fs} μmhoe Max	G_{oss} (μmho) Max	CMRR (dB) Min	V_{gs} (V) Min	V_{gs} (V) Max	V_p (V) Min	V_p (V) Max	I_{DSS} (mA) Min	I_{DSS} (mA) Max	G_{fs} (mmho) Min	G_{fs} (mmho) Max	G_{oss} (μmho) Max	I_{GSS} (pA) @ V_{DG} Max	I_{GSS} (pA) @ V_{DG} (V)	C_{iss} (pF) Max	C_{rss} (pF) Max	BV (V) Min	e_n (nV/√Hz)@f Max	e_n (nV/√Hz)@f (Hz)	I_{DSS} Match %	G_{fs} Match %	G_{oss1-2} (μmho)	I_{G1}-I_{G2} 125°C (nA)	Process No.	Pkg. No.
2N3921	TO-71	10	700	5	10	250	1500		20				−3.0	1	10	1.5	7.5	35	1000	30	18	6	50	100	1000		5				83	12
2N3922	TO-71	10	700	5	25	250	1500		20				−3.0	1	10	1.5	7.5	35	1000	30	18	6	50	100	1000		5				83	12
2N3934	TO-71	10	200	5	10	100	300		5				See 2N3954-6 as an improved replacement																				12
2N3935	TO-71	10	200	5	25	100	300		5				See 2N3954-6 as an improved replacement																				12
2N3954A	TO-71	20	200	5	5	50					0.5	4	1	4.5	0.5	5	1	3	35	100	30	4	1.2	50	150	100	5	3		10	83	12
2N3954	TO-71	20	200	5	10	50					0.5	4	1	4.5	0.5	5	1	3	35	100	30	4	1.2	50	150	100	5	3		10	83	12
2N3955A	TO-71	20	200	5	15	50					0.5	4	1	4.5	0.5	5	1	3	35	100	30	4	1.2	50	150	100	5	3		10	83	12
2N3955	TO-71	20	200	10	25	50					0.5	4	1	4.5	0.5	5	1	3	35	100	30	4	1.2	50	150	100	5	5		10	83	12
2N3956	TO-71	20	200	15	50	50					0.5	4	1	4.5	0.5	5	1	3	35	100	30	4	1.2	50	150	100	5	5		10	83	12
2N3957	TO-71	20	200	20	75	50					0.5	4	1	4.5	0.5	5	1	3	35	100	30	4	1.2	50	150	100	10	10		10	83	12
2N3958	TO-71	20	200	25	100	50					0.5	4	1	4.5	0.5	5	1	3	35	100	30	4	1.2	50	150	100	15	15		10	83	12
2N4082	TO-71	10	200	15	10	100	300		10				See 2N3954-6 as an improved replacement																				12
2N4083	TO-71	10	200	15	25	100	300		10				See 2N3954-6 as an improved replacement																				12
2N4084	TO-71	10	700	15	10	250	1500		20		0.5	4		3	1	10	1.5	7.5	35	1000	30	18	6	50	100	1000		5				83	12
2N4085	TO-71	10	700	15	25	250	1500		20					3	1	10	1.5	7.5	35	1000	30	18	6	50	100	1000		5				83	12
2N5047	TO-71	15	200	15	200								0.5	4.5	0.5	8	1.5	6	25	250	30	8	4	50	200	10		20	3			83	12
2N5196	TO-71	20	200	5	5	15	700	1500	4		0.2	3.8	0.7	4.5	0.7	7	1	4	50	25	30	6	2	50	20	1000	5	3	1	5	83	12
2N5197	TO-71	20	200	5	10	15	700	1500	4		0.2	3.8	0.7	4.5	0.7	7	1	4	50	25	30	6	2	50	20	1000	5	3	1	5	83	12
2N5198	TO-71	20	200	10	20	15	700	1500	4		0.2	3.8	0.7	4.5	0.7	7	1	4	50	25	30	6	2	50	20	1000	5	5	1	5	83	12
2N5199	TO-71	20	200	15	40	17	700	1500	4		0.2	3.8	0.7	4.5	0.7	7	1	4	50	25	30	6	2	50	20	1000	5	5	1	5	83	12
2N5452	TO-71	20	200	5	5				1		0.2	4.2	1	4.5	0.5	5	1	3	3	100	30	4	1.2	50	20	1000	5	3	0.25		83	12
2N5453	TO-71	20	200	10	10				1		0.2	4.2	1	4.5	0.5	5	1	3	3	100	30	4	1.2	50	20	1000	5	3	0.25		83	12
2N5454	TO-71	20	200	15	25				1		0.2	4.2	1	4.5	0.5	5	1	3	3	100	30	4	1.2	50	20	1000	5	5	0.25		83	12

N-CHANNEL FETS (Continued)

GENERAL PURPOSE DUAL JFETS (Continued)

Type No.	Case Style	Operating Conditions For These Characteristics: Op. Char. V_{DG} (V)	Op. Char. I_D (μA)	$\lvert V_{GS1-2}\rvert$ V_{OS} (mV) Max	Drift (μV/°C) ΔV_{GS} Max	I_G (pA) Max	G_{fs} μmhos Min	G_{fs} μmhos Max	G_{oss} (μmho) Max	CMRR (dB) Min	V_{gs} (V) Min	V_{gs} (V) Max	V_P (V) Min	V_P (V) Max	I_{DSS} (mA) Min	I_{DSS} (mA) Max	G_{fs} (mmho) Min	G_{fs} (mmho) Max	G_{oss} (μmho) Max	I_{GSS} (pA) @ V_{DG} Max	I_{GSS} (pA) @ V_{DG} (V)	C_{iss} (pF) Max	C_{rss} (pF) Max	BV (V) Min	e_n (nV/√Hz)@f Max	e_n (nV/√Hz)@f (Hz)	I_{DSS} Match %	G_{fs} Match %	G_{oss1-2} (μmho)	I_{G1}-I_{G2} 125°C (nA)	Process No.	Pkg. No.
2N5545	TO-71	15	200	5	10	50							0.5	4.5	0.5	8	1.5	6	25	100	30	6	2	50	180	10	5	3	1	5	83	12
2N5546	TO-71	15	200	10	20	50							0.5	4.5	0.5	8	1.5	6	25	100	30	6	2	50	200	10	10	5	2	5	83	12
2N5547	TO-71	15	200	15	40	50							0.5	4.5	0.5	8	1.5	6	25	100	30	6	2	50			10	10	3	5	83	12
2N5561	TO-71	10	700	5	5		2000	3000	4		0.2	2.71	0.8	3	1	10				100	30	15	4	50	50	10	5	3	0.3	10	98	12
2N5562	TO-71	10	700	10	10		2000	3000	4		0.2	2.71	0.8	3	1	10				100	30	15	4	50	50	10	5	3	0.4	10	98	12
2N5563	TO-71	10	700	15	25		2000	3000	4		0.2	2.71	0.8	3	1	10				100	30	15	4	50	50	10	5	3	0.5	10	98	12
J401		10	200	5	10	100	1000	1600	2	95		2.3	0.5	2.5	0.5	10	2	7	20	100	30	8	3	50	20	10					98	60
J402	8-Pin	10	200	10	10	100	1000	1600	2	95		2.3	0.5	2.5	0.5	10	2	7	20	100	30	8	3	50	20	10					98	60
J403	Mini-	10	200	10	25	100	1000	1600	2	95		2.3	0.5	2.5	0.5	10	2	7	20	100	30	8	3	50	20	10					98	60
J404	DIP	10	200	15	25	100	1000	1600	2	95		2.3	0.5	2.5	0.5	10	2	7	20	100	30	8	3	50	20	10					98	60
J405		10	200	20	40	100	1000	1600	2	90		2.3	0.5	2.5	0.5	10	2	7	20	100	30	8	3	50	20	10					98	60
J406		10	200	40	80	100	1000	1600	2			2.3	0.5	2.5	0.5	10	2	7	20	100	30	8	3	50	20	10					98	60
J410	8-Pin	20	200	10	10	250	600	1200	5		0.3	4	0.5	3.5	0.5	6	1	4	20	250	20	4.5	1.2	40	50	100					83	60
J411	Mini-	20	200	25	25	250	600	1200	5		0.3	4	0.5	3.5	0.5	6	1	4	20	250	20	4.5	1.2	40	50	100					83	60
J412	DIP	20	200	40	80	250	600	1200	5		0.3	4	0.5	3.5	0.5	6	1	4	20	250	20	4.5	1.2	40	50	100					83	60
NPD8301	8-Pin	20	200	5	10	100	700	1200	5	70	0.3	4	0.5	3.5	0.5	6	1	4	20	100	20	4.5	1.2	40	50	100					83	67
NPD8302	Mini-	20	200	10	15	100	700	1200	5		0.3	4	0.5	3.5	0.5	6	1	4	20	100	20	4.5	1.2	40	50	100					83	67
NPD8303	DIP	20	200	15	25	100	700	1200	5		0.3	4	0.5	3.5	0.5	6	1	4	20	100	20	4.5	1.2	40	50	100					83	67
U231	TO-71	20	200	5	10	50	600		10		0.3	4	See 2N3954 as an improved replacement																		83	12
U232	TO-71	20	200	10	25	50	600		10		0.3	4	See 2N3955 as an improved replacement																		83	12
U233	TO-71	20	200	15	50	50	600		10		0.3	4	See 2N3956 as an improved replacement																		83	12
U234	TO-71	20	200	20	75	50	600		10		0.3	4	See 2N3957 as an improved replacement																		83	12

U403	TO-71	10	200	10	25	15	1000	1600	2	95	2.3	0.5	2.5	0.5	10	2	7	20	25	30	8	3	50	20	10		96	12
U404	TO-71	10	200	15	25	15	1000	1600	2	95	2.3	0.5	2.5	0.5	10	2	7	20	25	30	8	3	50	20	10		96	12
U405	TO-71	10	200	20	40	15	1000	1600	2	90	2.3	0.5	2.5	0.5	10	2	7	20	25	30	8	3	50	20	10		96	12
U406	TO-71	10	200	40	80	15	1000	1600	2		2.3	0.5	2.5	0.5	10	2	7	20	25	30	8	3	50	20	10		96	12

† I_D = 100 μA for V_{GS} for 2N5561/2/3 only.

LOW FREQUENCY — LOW NOISE DUAL JFETS

		Operating Conditions For These Characteristics																															
Type No.	Case Style	Op. Char. V_{DG} (V)	Op. Char. I_D (μA)	$\lvert V_{GS1\text{-}2}\rvert$ V_{OS} (mV) Max	Drift (μV/°C) ΔV_{GS} Max	I_G (pA) Max	G_{fs} μmhoe Min	G_{fs} μmhoe Max	G_{oss} (μmho) Max	CMRR (dB) Min	V_{GS} (V) Min	V_{GS} (V) Max	V_P (V) Min	V_P (V) Max	I_{DSS} (mA) Min	I_{DSS} (mA) Max	G_{fs} (mmho) Min	G_{fs} (mmho) Max	G_{oss} (μmho) Max	I_{GSS} (pA) @ V_{DG} Max	I_{GSS} (pA) @ V_{DG} (V)	C_{iss} (pF) Max	C_{rss} (pF) Max	BV (V) Min	e_n (nV/√Hz)@f Max	e_n (nV/√Hz)@f (Hz)	I_{DSS} Match %	G_{fs} Match %	$G_{oss1\text{-}2}$ (μmho)	I_{G1}-I_{G2} 125°C (nA)	Process No.	Pkg. No.
2N5515	TO-71	20	200	5	5	100	500	1000	1	100	0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	30	10	5	3	0.1	10	95	12
2N5516	TO-71	20	200	5	10	100	500	1000	1	100	0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	30	10	5	3	0.1	10	95	12
2N5517	TO-71	20	200	10	20	100	500	1000	1	90	0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	30	10	5	5	0.1	10	95	12
2N5518	TO-71	20	200	15	40	100	500	1000	1		0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	30	10	5	5	0.1	10	95	12
2N5519	TO-71	20	200	15	80	100	500	1000	1		0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	30	10	10	10	0.1	10	95	12
2N5520	TO-71	20	200	5	5	100	500	1000	1	100	0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	15	10	5	3	0.1	10	95	12
2N5521	TO-71	20	200	5	10	100	500	1000	1	100	0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	15	10	5	3	0.1	10	95	12
2N5522	TO-71	20	200	10	20	100	500	1000	1	90	0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	15	10	5	5	0.1	10	95	12
2N5523	TO-71	20	200	15	40	100	500	1000	1		0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	15	10	5	5	0.1	10	95	12
2N5524	TO-71	20	200	15	80	100	500	1000	1		0.2	3.8	0.7	4	0.5	7.5	1	4	10	250	30	25	5.0	40	15	10	10	10	0.1	10	95	12
2N6483	TO-71	20	200	5	5	100	500	1500	1	100	0.2	3.8	0.7	4	0.5	7.5	1	4	10	200	30	20	3.5	50	10	10	5	3	0.1	10	95	12
2N6484	TO-71	20	200	10	10	100	500	1500	1	100	0.2	3.8	0.7	4	0.5	7.5	1	4	10	200	30	20	3.5	50	10	10	5	3	0.1	10	95	12
2N6485	TO-71	20	200	15	25	100	500	1500	1	90	0.2	3.8	0.7	4	0.5	7.5	1	4	10	200	30	20	3.5	50	10	10	5	5	0.1	10	95	12

N-CHANNEL FETS (Continued)

WIDE BAND — LOW NOISE DUAL JFETS

Type No.	Case Style	Operating Conditions For These Characteristics: Op. V_{DG} (V)	Char. I_D (μA)	V_{GS1-2} V_{OS} (mV) Max	Drift (μV/°C) ΔV_{GS} Max	I_G (pA) Max	G_{fs} (μmhos) Min	G_{fs} (μmhos) Max	G_{oss} (μmho) Max	CMRR (dB) Min	V_{gs} (V) Min	V_{gs} (V) Max	V_P (V) Min	V_P (V) Max	I_{DSS} (mA) Min	I_{DSS} (mA) Max	G_{fs} (mmho) Min	G_{fs} (mmho) Max	G_{oss} (μmho) Max	I_{GSS} (pA) @ V_{DG} Max	I_{GSS} (pA) @ V_{DG} (V)	C_{iss} (pF) Max	C_{rss} (pF) Max	BV (V) Min	e_n (nV/√Hz)@f Max	e_n (nV/√Hz)@f (Hz)	I_{DSS} Match %	G_{fs} Match %	Q_{oss1-2} (μmho)	$I_{G1-I_{G2}}$ 125°C (nA)	Process No.	Pkg. No.
2N5564	TO-71	15	2000	5	10		1500		45						5	30				100	20	12	3	40	50	10	5	5			96	12
2N5565	TO-71	15	2000	10	25		1500		45						5	30				100	20	12	3	40	50	10	5	10			96	12
2N5566	TO-71	15	2000	20	50		1500		45						5	30				100	20	12	3	40	50	10	5	10			96	12
2N5911	TO-78	10	5000	10	20	100	5000	10,000	100			0.3	4		5	40				100	15	5	1.2	25	20	10,000	5	5	20	20	93	24
2N5912	TO-78	10	5000	15	40	100	5000	10,000	100			0.3	4		5	40				100	15	5	1.2	25	20	10,000	5	5	20	20	93	24
NPD5564	8 Pin	15	2000	5	10		1500		45						5	30				100	20	12	3	40	50	10	5	5			96	67
NPD5565	Mini	15	2000	10	25		1500		45						5	30				100	20	12	3	40	50	10	5	10			96	67
NPD5566	DIP	15	2000	20	50		1500		45						5	30				100	20	12	3	40	50	10	5	10			96	67
U257	TO-78	10	5000	100			5000	10,000	150						1	5	5	40		100	15	5	1.2	25	30	10,000	15	15	20		93	24
U430	TO-99	10	10,000				10,000	20,000	150						1	4	12	30		150	15			25	10	100	10	10			92	24
U431	TO-99	10	10,000				10,000	20,000	150						2	8	24	60		150	15			25	10	100	10	10			92	24

LOW LEAKAGE — HIGH CMRR — WIDE BAND DUAL JFETS

Type No.	Case Style	Operating Conditions For These Characteristics: Op. V_{DG} (V)	Char. I_D (μA)	V_{GS1-2} V_{OS} (mV) Max	Drift (μV/°C) ΔV_{GS} Max	I_G(pA) @ 35V V_{DG}	G_{fs} (μmhos) Min	G_{fs} (μmhos) Max	G_{oss} (μmho) Max	CMRR (dB) Min	V_{gs} (V) Min	V_{gs} (V) Max	V_P (V) Min	V_P (V) Max	I_{DSS} (mA) Min	I_{DSS} (mA) Max	G_{fs} (mmho) Min	G_{fs} (mmho) Max	G_{oss} (μmho) Max	I_{GSS} (pA) @ V_{DG} Max	I_{GSS} (pA) @ V_{DG} (V)	C_{iss} (pF) Max	C_{rss} (pF) Max	BV (V) Min	e_n (nV/√Hz)@f Max	e_n (nV/√Hz)@f (Hz)	I_{DSS} Match %	G_{fs} Match %	Q_{oss1-2} (μmho)	$I_{G1-I_{G2}}$ 125°C (nA)	Process No.	Pkg. No.

NDF9407	TO-71	20	200	5	10	5	[illegible]	2000	1	125	0.1	4	0.5	4	0.5	10			10	30	5	0.02	50	30	10	5	3	0.1	1	94	12
NDF9408	TO-71	20	200	10	10	5	[illegible]	2000	1	110	0.1	4	0.5	4	0.5	10			10	30	5	0.02	50	30	10	5	5	0.1	1	94	12
NDF9409	TO-71	20	200	15	10	5	[illegible]	2000	1	110	0.1	4	0.5	4	0.5	10			10	30	5	0.02	50	30	10	5	5	0.1	1	94	12
NDF9410	TO-71	20	200	25	25	5	[illegible]	2000	1	100	0.1	4	0.5	4	0.5	10			10	30	5	0.02	50	30	10	10	10	0.1	1	94	12

ULTRA LOW LEAKAGE DUALS

Type No.	Case Style	Operating Conditions For These Characteristics: Oper. Cond. V_{DG} (V)	Oper. Cond. I_D (μA)	V_{GS1-2} V_{OS} (mV) Max	ΔV_{GS} Drift (μV/°C) Max	I_G (pA) Max	G_{fs} (mmho) Min	G_{oss} (μmho) Max	V_{GS} (V) Max	V_p (V) Min	V_p (V) Max	I_{DSS} (mA) Min	I_{DSS} (mA) Max	G_{fs} (mmho) Min	G_{fs} (mmho) Max	G_{oss} (μmho) Max	I_{GSS} (pA) @ V_{GS} Max	I_{GSS} (pA) @ V_{GS} (V)	C_{iss} (pF) Max	C_{rss} (pF) Max	BV_{GSS} (V) Min	I_{G1}-I_{G2} @ 125°C (nA) Max	Process No.	Pkg. No.
2N5902	TO-78	10	30	5	5	3	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	5	5	20	3	1.5	40	2	84	24
2N5903	TO-78	10	30	5	10	3	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	5	5	20	3	1.5	40	2	84	24
2N5904	TO-78	10	30	10	20	3	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	5	5	20	3	1.5	40	2	84	24
2N5905	TO-78	10	30	15	40	3	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	4	5	20	3	1.5	40	2	84	24
2N5906	TO-78	10	30	5	5	1	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	5	2	20	3	1.5	40	0.2	84	24
2N5907	TO-78	10	30	5	10	1	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	5	2	20	3	1.5	40	0.2	84	24
2N5908	TO-78	10	30	10	20	1	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	5	2	20	3	1.5	40	0.2	84	24
2N5909	TO-78	10	30	15	40	1	50 μ	1	4	0.6	4.5	30 μ	0.5	70 μ	0.25	5	2	20	3	1.5	40	0.2	84	24

N-CHANNEL FETS (Continued)

ULTRA LOW LEAKAGE DUALS (Continued)

Type No.	Case Style	Operating Conditions For These Characteristics: Oper. Cond. V_{DG} (V)	Oper. Cond. I_D (μA)	V_{GS1-2} V_{OS} (mV) Max	ΔV_{GS} Drift (μV/°C) Max	I_G (pA) Max	G_{fs} (mmho) Min	G_{oss} (μmho) Max	V_{GS} (V) Max	V_P (V) Min	V_P (V) Max	I_{DSS} (mA) Min	I_{DSS} (mA) Max	G_{fs} (mmho) Min	G_{fs} (mmho) Max	G_{oss} (μmho) Max	I_{GSS} (pA) @ V_{GS} Max	I_{GSS} @ V_{GS} (V)	C_{iss} (pF) Max	C_{rss} (pF) Max	BV_{GSS} (V) Min	$I_{G1-I_{G2}}$ @ 125°C (nA) Max	Process No.	Pkg. No.
U421	TO-78																						86	24
U422	TO-78																						86	24
U423	TO-78																						86	24
U424	TO-78																						86	24
U425	TO-78																						86	24
U426	TO-78																						86	24

Process In Development

SWITCHES

Transistor Type	Case Style	BV_{GSS} BV_{GDO} (V) Min	@ I_G (μA)	I_{GSS} (nA) Max	@ V_{DG} (V)	$I_{D(off)}$ (nA) Max	@ V_{DS} (V)	V_{GS} (V)	V_p (V) Min	Max	@ V_{DS} (V)	I_D (μA)	I_{DSS} (mA) Min	Max	@ V_{DS} (V)	r_{ds} (Ω) Max	@ I_D (mA)	C_{iss} (pF) Max	@ V_{DS} (V)	V_{GS} (V)	C_{rss} (pF) Max	@ V_{DS} (V)	V_{GS} (V)	t_{on} (ns) Max	t_{off} (ns) Max	Process No.	Pkg. No.
2N3382	TO-72	30	1	15	30	2	−5	6	1	5	−5	1	3	30	10	300										88	23
2N3384	TO-72	30	1	15	30	2	−5	6	4	5	−5	1	15	30	10	180										88	23
2N3386	TO-72	30	1	15	30	2.5	−5	10	4	9.5	−5	1	15	50	10	150										88	23
2N3993	TO-72	25	1	1.0	15	1.2	−10	10	4	9.5	−10	1	10		10	150		16	−10	0	4.5	0	10			88	23
2N3993A	TO-72	25	1	1.0	15	1.2	−10	10	4	9.5	−10	1	10		10	150		12	−10	0	3	0	10			88	23
2N3994	TO-72	25	1	1.0	15	1.2	−10	6	1	5.5	−10	1	2		10	300		16	−10	0	4.5	0	10			88	23
2N3994A	TO-72	25	1	1.0	15	1.2	−10	6	1	5.5	−10	1	2		10	300		12	−10	0	3	0	10			88	23
2N5018	TO-18	30	1	2	15	10	−15	12		10	−15	1	10		20	75		45	−15	0	10	0	12	35	65	88	11
2N5019	TO-18	30	1	2	15	10	−15	7		5	−15	1	5		20	150		45	−15	0	10	0	7	90	125	88	11
• 2N5114	TO-18	30	1	0.5	20	0.5	−15	12	5	10	−15	0.001	30	90	18	75	1	25	−15	0	7	0	12	16	21	88	11
• 2N5115	TO-18	30	1	0.5	20	0.5	−15	7	3	6	−15	0.001	16	60	15	100	1	25	−15	0	7	0	7	30	38	88	11
• 2N5116	TO-18	30	1	0.5	20	0.5	−15	5	1	4	−15	0.001	5	25	15	150	1	25	−15	0	7	0	5	42	60	88	11
J174	TO-92	30	1	1	20	1	−15	10	5	10	−15	0.01	20	100	15	85	1	11	0	10	5.5	0	10	2	5	88	74
J175	TO-92	30	1	1	20	1	−15	10	3	6	−15	0.01	7	60	15	125	0.5	11	0	10	5.5	0	10	5	10	88	74
J176	TO-92	30	1	1	20	1	−15	10	1	4	−15	0.01	2	25	15	250	0.25	11	0	10	5.5	0	10	15	15	88	74

P-CHANNEL FETS (Continued)

SWITCHES (Continued)

Transistor Type	Case Style	BV_{GSS} BV_{GDO} (V) @ I_G Min	(μA)	I_{GSS} (nA)@V_{DG} Max	(V)	$I_{D(off)}$ (nA)@V_{DS} Max	(V)	V_{GS} (V)	V_p (V) Min	Max	@ V_{DS} (V)	I_D (μA)	I_{SS} (mA) @ V_{DS} Min	Max	(V)	r_{ds} (Ω) @ I_D Max	(mA)	C_{iss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	C_{rss} (pF)@V_{DS} Max	(V)	V_{GS} (V)	t_{on} (ns) Max	t_{off} (ns) Max	Process No.	Pkg. No.
J177	TO-92	30	1	1	20	1	−15	10	0.8	2.25	−15	0.01	1.5	20	15	300	0.1	11	0	10	5.5	0	10	20	20	88	74
P1086E	TO-92	30	1	2	20	10	−15	10		10	−15	0.01	10		15	75	1	45	−15	0	10	−15	0	35	50	88	71
P1087E	TO-92	30	1	2	20	10	−15	5		5	−15	0.01	5		15	150		45	−15	0	10	−15	0	40	75	88	71
U304	TO-18	30	1	0.5	20	0.5	−15	12	5	10	−15	1	30	90	15	85		27	−15	0	7	0	12	35	35	88	11
U305	TO-18	30	1	0.5	20			7	3	4	−15	1	15	60	15	110		27	−15	0	7	0	7	50	45	88	11
U306	TO-18	30	1	0.5	20			5	1	4	−15	1	5	25	15	175		27	−15	0	7	0	5	60	80	88	11

• **Note:** JAN qualified per applicable MIL-S-19500 specification.

AMPLIFIERS

Transistor Type	Case Style	BV_{GSS} BV_{GDO} (V) @ I_G Min	(μA)	I_{GSS} (nA)@V_{DG} Max	(V)	V_p (V) Min	Max	@ V_{DS} (V)	I_D (μA)	I_{DSS} (mA) @ V_{DS} Min	Max	(V)	G_{fs} (mmho) @ V_{DS} Min	Max	(V)	G_{oss} (μmho) V_{DS} Max	(V)	C_{iss} (pF) V_{DS} Max	(V)	V_{GS} (V)	C_{rss} (pF) V_{DS} Max	(V)	V_{GS} (V)	e_n $\left(\frac{nV}{\sqrt{Hz}}\right)$ @ Freq Max	(Hz)	Process No.	Pkg. No.
J201	TO-92	40	1	100	15	0.3	1.5	15	0.1	0.2	0.9	15	1000	2500	15	25	15	4.5	15	0	1.5	2.5	15	0	12	100	88	74
J202	TO-92	40	1	100	15	0.8	4	15	0.1	0.9	4.5	15	1000	4500	15	50	15	8	15	0	3	4	15	0	8	100	88	74
J203	TO-92	40	1	100	15	2.5	6.5	15	0.1	4.5	20	15	2000	6500	15	75	15	12	15	0	4	6	15	0	6	100	88	74
P1086	TO-92	30	1	2	20	0.8	4	10		1	5	10	1000	4000	10	75	10	45	−15	0	10	10	−15	0	35	100	88	71
P1087	TO-92	30	1	2	20	0.8	4	10		1	5	10	1000	4000	10	75	10	45	−15	0	10	10	−15	0	35	100	88	71

2N2609	TO-18	30	1	30	30		4							2	10/1 mA	20	10	20	−10	1				125	1000	89	23
2N3330	TO-72	20	10	10	10		6	−15	10	2	6	10	1.5	3	10/2 mA	40	10	20	−10	1				125	1000	89	23
2N3331	TO-72	20	10	10	10		8	−15	10	5	15	10	2	4	10/5 mA	100	10	20	−10	1				155	1000	89	23
2N3332	TO-72	20	10	10	10		6	−15	10	1	6	10	1	2.2	10/1 mA	20	10	20	−10	1				65	1000	89	23
2N3820	TO-92	20	10	20	10		8.0	−10	10	0.3	15	10	0.8	5	10	200	10	32	−10	0	16	−10	0			89	74
2N4381	TO-18	25	1	1	15	1	5	−15	1	3	12	15	2	6	15	75	15	20	−15	0	5	−15	0	20	1000	89	11
2N5020	TO-18	25	1	1	15	0.3	1.5	−15	1	0.3	1.2	15	1	3.5	15	20	15	25	−15	0	7	−15	0	30	1000	89	11
2N5021	TO-18	25	1	1	15	0.5	2.5	−15	1	1	3.5	15	1.5	6	15	20	15	25	−15	0	7	−15	0	30	1000	89	11
2N5460	TO-92	40	10	5	20	0.75	6	−15	1	1	5	15	1	4	15	50	15	7	−15	0	2	−15	0	115	100	89	71
2N5461	TO-92	40	10	5	20	1	7.5	−15	1	2	9	15	1.5	5	15	50	15	7	−15	0	2	−15	0	115	100	89	71
2N5462	TO-92	40	10	5	20	1.8	9	−15	1	4	16	15	2	6	15	50	15	7	−15	0	2	−15	0	115	100	89	71
J270	TO-92	30	1	0.2	20	0.5	2.0	−15	0.001	2	15	15	6.0	15	15	200	15	t20	−15	0	t5	−15	0	t10	1000	88	74
J271	TO-92	30	1	0.2	20	1.5	4.5	−15	0.001	6	50	15	8.0	18		500	15	t20	−15	0	t5	−15	0	t10	1000	88	74
PN4342	TO-92	25	10	10	15		5.5	−10	1	4	12	10	2	6	10	75	10	20	−10	0	5	−10	0	80	100	89	71
PN4360	TO-92	20	10	10	15	0.7	10	−10	1	3	30	10	2	8	10	100	10	20	−10	0	5	−10	0	190	100	89	71
PN5033	TO-92	20	10	10	15	0.3	2.5	−10	1	0.3	3.5	10	1	5	10	20	10	25	−10	0	7	−10	0	100	1000	89	71

• **Note:** JAN qualified per applicable MIL-S-19500 specification.
t = typical value.

PRO-ELECTRON FETS

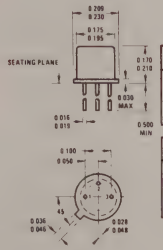
AMPLIFIERS

Type No.	Case Style	BV_{GSS} BV_{GDO} (V) @ I_G		I_{GSS} (nA)@V_{GD}		V_P				V_{GS}				I_{DSS}			$R_e(Y_{fs})$			C_{iss}			C_{rss}			NF (dB)@R_G = 1k e_n*	f	Process No.	Pkg. No.
		Min	(μA)	Max	(V)	Min	(V) @ Max	V_{DS} (V)	I_D (nA)	Min	(V) @ Max	V_{DS} (V)	I_D (μA)	Min	(mA) @ Max	V_{DS} (V)	Min	(mmho) @ Max	f (MHz)	Typ	(pF)@V_{DS} (V)	V_{GS} (V)	Typ	(pF)@V_{DS} (V)	V_{GS} (V)	Typ	(Hz)* (MHz)		
BF244A	TO-92	30	1	5	20	0.5	8	15	10	0.4	2.2	15	200	2	6.5	15	3	6.5	0.001	4	20	−1	1.1	20	−1	1.5	100	50	74
BF244B	TO-92	30	1	5	20	0.5	8	15	10	1.6	3.8	15	200	6	15	15	3	6.5	0.001	4	20	−1	1.1	20	−1	1.5	100	50	74
BF244C	TO-92	30	1	5	20	0.5	8	15	10	3.2	7.5	15	200	12	25	15	3	6.5	0.001	4	20	−1	1.1	20	−1	1.5	100	50	74
BF245A	TO-92	30	1	5	20	0.5	8	15	10	0.4	2.2	15	200	2	6.5	15	3	6.5	0.001	4	20	−1	1.1	20	−1			50	77
BF245B	to-92	30	1	5	20	0.5	8	15	10	1.6	3.8	15	200	6	15	15	3	6.5	0.001	4	20	−1	1.1	20	−1			50	77
BF245C	TO-92	30	1	5	20	0.5	8	15	10	3.2	7.5	15	200	12	25	15	3	6.5	0.001	4	20	−1	1.1	20	−1			50	77
BF246A	TO-92	25	1	5	15	0.6	14.5	15	10	1.5	4	15	200	30	80	15	8		0.001	11	15	0	3.5	15	0			51	74
BF246B	TO-92	25	1	5	15	0.6	14.5	15	10	3	7	15	200	60	140	15	8		0.001	11	15	0	3.5	15	0			51	74
BF246C	TO-92	25	1	5	15	0.6	14.5	15	10	5.5	12	15	200	110	250	15	8		0.001	11	15	0	3.5	15	0			51	74
BF247A	TO-92	25	1	5	15	0.6	14.5	15	10	1.5	4	15	200	30	80	15	8		0.001	11	15	0	3.5	15	0			51	77
BF247B	TO-92	25	1	5	15	0.6	14.5	15	10	3	7	15	200	60	140	15	8		0.001	11	15	0	3.5	15	0			51	77
BF247C	TO-92	25	1	5	15	0.6	14.5	15	10	5.5	12	15	200	110	250	15	8		0.001	11	15	0	3.5	15	0			51	77
BF256A	TO-92	30	1	5	20					0.5	7.5	15	200	3	7	15	4.5		0.001				0.7	20	−1	7.5	800	50	77
BF256B	TO-92	30	1	5	20					0.5	7.5	15	200	6	13	15	4.5		0.001				0.7	20	−1	7.5	800	50	77

BC264A	TO-92	30	1	10	20	0.5	15	10	0.2	1.2	15	1000	2	4.5	15	2.5	0.001	4	15	−1	1.2	15	−1	40°	10°	50	77
BC264B	TO-92	30	1	10	20	0.5	15	10	0.4	1.4	15	1500	3.5	6.5	15	3	0.001	4	15	−1	1.2	15	−1	40°	10°	50	77
BC264C	TO-92	30	1	10	20	0.5	15	10	0.5	1.5	15	2500	5	8	15	3.5	0.001	4	15	−1	1.2	15	−1	40°	10°	50	77
BC264D	TO-92	30	1	10	20	0.5	15	10	0.6	1.6	15	3500	7	12	15	4	0.001	4	15	−1	1.2	15	−1	40°	10°	50	77

SELECTION GUIDE

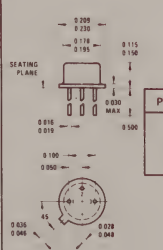
TO-18 (02, 11)



PIN	FET N (02)
1	S
2	D
3	G

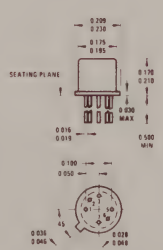
PIN	FET P (11)
1	S
2	G
3	D

TO-52 (07)



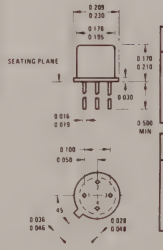
PIN	FET (07)
1	S
2	D
3	G

TO-71 (12)



PIN	FET (12)
1	S1
2	D1
3	G1
5	S2
6	D2
7	G2

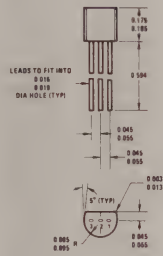
TO-72 (23, 25)



PIN	FET N (25)
1	S
2	D
3	G
4	CASE

PIN	FET P (23)
1	S
2	G
3	D
4	CASE

TO-92 (71, 72, 74)

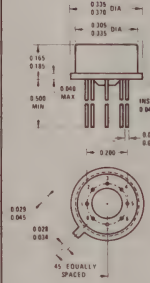


PIN	71 FET
1	G
2	D
3	S

PIN	72 FET
1	G
2	S
3	D

PIN	74 FET
1	S
2	G
3	D

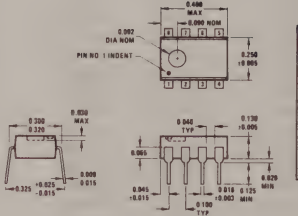
TO-99 (24)



PIN	FET (24)
1	S
2	D
3	G
4	SUB
5	S
6	D
7	G
8	NC

8-Pin Mini-DIP (60, 67)

PIN	FET (60)
1	NC
2	S1
3	D1
4	G1
5	S2
6	D2
7	G2
8	NC



PIN	FET (67)
1	S1
2	D1
3	NC
4	G1
5	S2
6	D2
7	NC
8	G2

POWER TRANSISTOR PART NUMBER AND PACKAGE LISTING

Part Number	Package
2N4918	TO-126
2N4919	TO-126
2N4920	TO-126
2N4921	TO-126
2N4922	TO-126
2N4923	TO-126
2N5190	TO-126
2N5191	TO-126
2N5192	TO-126
2N5193	TO-126
2N5194	TO-126
2N5195	TO-126
2N5293	TO-220
2N5294	TO-220
2N5295	TO-220
2N5296	TO-220
2N5297	TO-220
2N5298	TO-220
2N5490	TO-220
2N5491	TO-220
2N5492	TO-220
2N5493	TO-220

Part Number	Package
2N6288	TO-220
2N6289	TO-220
2N6290	TO-220
2N6291	TO-220
2N6292	TO-220
2N6293	TO-220
2N6386	TO-220
2N6387	TO-220
2N6388	TO-220
2N6486	TO-220
2N6487	TO-220
2N6488	TO-220
2N6489	TO-220
2N6490	TO-220
2N6491	TO-220
2N6548	TO-202
2N6549	TO-202
2N6551	TO-202
2N6552	TO-202
2N6553	TO-202
2N6554	TO-202
2N6555	TO-202

Part Number	Package
2N6735	TO-237
92PE37A	TO-237
92PE37B	TO-237
92PE37C	TO-237
92PE487	TO-237
92PE488	TO-237
92PE489	TO-237
92PE77A	TO-237
92PE77B	TO-237
92PE77C	TO-237
92PU01	TO-237
92PU01A	TO-237
92PU05	TO-237
92PU06	TO-237
92PU07	TO-237
92PU10	TO-237
92PU100	TO-237
92PU200	TO-237
92PU36	TO-237
92PU36A	TO-237
92PU36B	TO-237
92PU36C	TO-237

Part Number	Package
D40K1	TO-202
D40K2	TO-202
D40N1	TO-202
D40N2	TO-202
D40P1	TO-202
D40P3	TO-202
D40P5	TO-202
D41D1	TO-202
D41D2	TO-202
D41D3	TO-202
D41D4	TO-202
D41D5	TO-202
D41D7	TO-202
D41D8	TO-202
D41D10	TO-202
D41D11	TO-202
D41D13	TO-202
D41D14	TO-202
D41E1	TO-202
D41E5	TO-202
D41E7	TO-202
D41K1	TO-202

Part Number	Package
D44C7	TO-220
D44C8	TO-220
D44C9	TO-220
D44C10	TO-220
D44C11	TO-220
D44C12	TO-220
D44H1	TO-220
D44H2	TO-220
D44H4	TO-220
D44H5	TO-220
D44H7	TO-220
D44H8	TO-220
D44H10	TO-220
D44H11	TO-220
D45C1	TO-220
D45C2	TO-220
D45C3	TO-220
D45C4	TO-220
D45C5	TO-220
D45C6	TO-220
D45C7	TO-220
D45C8	TO-220

Part Number	Package
MJE233	TO-126
MJE234	TO-126
MJE235	TO-126
MJE240	TO-126
MJE241	TO-126
MJE242	TO-126
MJE243	TO-126
MJE244	TO-126
MJE250	TO-126
MJE251	TO-126
MJE252	TO-126
MJE253	TO-126
MJE254	TO-126
MJE340	TO-126
MJE341	TO-126
MJE344	TO-126
MJE370	TO-126
MJE371	TO-126
MJE520	TO-126
MJE521	TO-126
MJE700	TO-126
MJE701	TO-126

2N6034	TO-126	2N6708	TO-237	92PU45A	TO-237	D42C4	TO-202	D45H1	TO-220	MJE712	TO-126
2N6035	TO-126	2N6709	TO-237	92PU51	TO-237	D42C5	TO-202	D45H2	TO-220	MJE720	TO-126
2N6036	TO-126	2N6710	TO-237	92PU51A	TO-237	D42C6	TO-202	D45H4	TO-220	MJE721	TO-126
2N6037	TO-126	2N6711	TO-237	92PU55	TO-237	D42C7	TO-202	D45H5	TO-220	MJE722	TO-126
2N6038	TO-126	2N6712	TO-237	92PU56	TO-237	D42C8	TO-202	D45H7	TO-220	MJE800	TO-126
2N6039	TO-126	2N6713	TO-237	92PU57	TO-237	D42C9	TO-202	D45H8	TO-220	MJE801	TO-126
2N6098	TO-220	2N6714	TO-237	D40C1	TO-202	D42C10	TO-202	D45H10	TO-220	MJE802	TO-126
2N6100	TO-220	2N6715	TO-237	D40C2	TO-202	D42C11	TO-202	D45H11	TO-220	MJE803	TO-126
2N6101	TO-220	2N6716	TO-237	D40C3	TO-202	D42C12	TO-202	MJE105T	TO-220	MJE2801T	TO-220
2N6102	TO-220	2N6717	TO-237	D40C4	TO-202	D43C1	TO-202	MJE170	TO-126	MJE2901T	TO-220
2N6103	TO-220	2N6718	TO-237	D40C5	TO-202	D43C2	TO-202	MJE171	TO-126	MJE2955T	TO-220
2N6108	TO-220	2N6719	TO-237	D40C7	TO-202	D43C3	TO-202	MJE172	TO-126	MJE3055T	TO-220
2N6109	TO-220	2N6720	TO-237	D40C8	TO-202	D43C4	TO-202	MJE180	TO-126	MJE3439	TO-126
2N6110	TO-220	2N6721	TO-237	D40D1	TO-202	D43C5	TO-202	MJE181	TO-126	MJE3440	TO-126
2N6111	TO-220	2N6722	TO-237	D40D2	TO-202	D43C6	TO-202	MJE182	TO-126	NSDU01	TO-202
2N6121	TO-220	2N6723	TO-237	D40D3	TO-202	D43C7	TO-202	MJE200	TO-126	NSDU01A	TO-202
2N6122	TO-220	2N6724	TO-237	D40D4	TO-202	D43C8	TO-202	MJE205T	TO-126	NSDU02	TO-202
2N6123	TO-220	2N6725	TO-237	D40D5	TO-202	D43C9	TO-202	MJE210	TO-126	NSDU05	TO-202
2N6124	TO-220	2N6726	TO-237	D40D7	TO-202	D43C10	TO-202	MJE220	TO-126	NSDU06	TO-202
2N6125	TO-220	2N6727	TO-237	D40D8	TO-202	D43C11	TO-202	MJE221	TO-126	NSDU07	TO-202
2N6126	TO-220	2N6728	TO-237	D40D10	TO-202	D43C12	TO-202	MJE222	TO-126	NSDU10	TO-202
2N6129	TO-220	2N6729	TO-237	D40D11	TO-202	D44C1	TO-220	MJE223	TO-126	NSDU45	TO-202
2N6130	TO-220	2N6730	TO-237	D40D13	TO-202	D44C2	TO-220	MJE224	TO-126	NSDU45A	TO-202
2N6131	TO-220	2N6731	TO-237	D40D14	TO-202	D44C3	TO-220	MJE225	TO-126	NSDU51	TO-202
2N6132	TO-220	2N6732	TO-237	D40E1	TO-202	D44C4	TO-220	MJE230	TO-126	NSDU51A	TO-202
2N6133	TO-220	2N6733	TO-237	D40E5	TO-202	D44C5	TO-220	MJE231	TO-126	NSDU52	TO-202
2N6134	TO-220	2N6734	TO-237	D40E7	TO-202	D44C6	TO-220	MJE232	TO-126	NSDU55	TO-202

POWER TRANSISTOR PART NUMBER AND PACKAGE LISTING (Continued)

Part Number	Package
NSDU56	TO-202
NSDU57	TO-202
NSD36	TO-202
NSD36A	TO-202
NSD36B	TO-202
NSD36C	TO-202
NSD102	TO-202
NSD103	TO-202
NSD104	TO-202
NSD105	TO-202
NSD106	TO-202
NSD123	TO-202
NSD127	TO-202
NSD131	TO-202
NSD132	TO-202
NSD133	TO-202
NSD134	TO-202
NSD135	TO-202
NSD151	TO-202
NSD152	TO-202
NSD153	TO-202
NSD154	TO-202
NSD202	TO-202

Part Number	Package
NSE171	TO-202
NSE180	TO-202
NSE181	TO-202
NSE457	TO-202
NSE458	TO-202
NSE459	TO-202
NSP41	TO-220
NSP41A	TO-220
NSP41B	TO-220
NSP41C	TO-220
NSP42	TO-220
NSP42A	TO-220
NSP42B	TO-220
NSP42C	TO-220
NSP121	TO-126
NSP370	TO-220
NSP371	TO-220
NSP520	TO-220
NSP521	TO-220
NSP575	TO-220
NSP576	TO-220
NSP577	TO-220
NSP578	TO-220

Part Number	Package
NSP599	TO-220
NSP600	TO-220
NSP601	TO-220
NSP602	TO-220
NSP605	TO-220
NSP607	TO-220
NSP608	TO-220
NSP609	TO-220
NSP610	TO-220
NSP695	TO-220
NSP695A	TO-220
NSP696	TO-220
NSP696A	TO-220
NSP697	TO-220
NSP697A	TO-220
NSP698	TO-220
NSP698A	TO-220
NSP699	TO-220
NSP699A	TO-220
NSP700	TO-220
NSP700A	TO-220
NSP701	TO-220
NSP702	TO-220

Part Number	Package
NSP2481	TO-220
NSP2482	TO-220
NSP2483	TO-220
NSP2490	TO-220
NSP2491	TO-220
NSP2520	TO-220
NSP2955	TO-220
NSP3054	TO-220
NSP3055	TO-220
NSP3740	TO-220
NSP3741	TO-220
NSP4918	TO-220
NSP4919	TO-220
NSP4920	TO-220
NSP4921	TO-220
NSP4922	TO-220
NSP4923	TO-220
NSP5190	TO-220
NSP5191	TO-220
NSP5192	TO-220
NSP5193	TO-220
NSP5194	TO-220
NSP5195	TO-220

Part Number	Package
SE9302	TO-220
SE9400	TO-220
SE9401	TO-220
SE9402	TO-220
TIP29	TO-220
TIP29A	TO-220
TIP29B	TO-220
TIP29C	TO-220
TIP30	TO-220
TIP30A	TO-220
TIP30B	TO-220
TIP30C	TO-220
TIP31	TO-220
TIP31A	TO-220
TIP31B	TO-220
TIP31C	TO-220
TIP32	TO-220
TIP32A	TO-220
TIP32B	TO-220
TIP32C	TO-220
TIP41	TO-220
TIP41A	TO-220
TIP41B	TO-220

Part Number	Package
TIP101	TO-220
TIP102	TO-220
TIP105	TO-220
TIP106	TO-220
TIP107	TO-220
TIP115	TO-220
TIP116	TO-220
TIP117	TO-220
TIP120	TO-220
TIP121	TO-220
TIP122	TO-220
TIP125	TO-220
TIP126	TO-220
TIP127	TO-220
TIP130	TO-220
TIP131	TO-220
TIP132	TO-220
TIP135	TO-220
TIP136	TO-220
TIP137	TO-220
TN2102	TO-237
TN2218A	TO-237
TN2219	TO-237

NSD457	TO-202	NSP585	TO-220	NSP2090	TO-220	NSP5978	TO-220	TIP42C	TO-220	TN3019	TO-237
NSD458	TO-202	NSP586	TO-220	NSP2091	TO-220	NSP5979	TO-220	TIP61	TO-220	TN3020	TO-237
NSD459	TO-202	NSP587	TO-220	NSP2092	TO-220	NSP5980	TO-220	TIP61A	TO-220	TN3053	TO-237
NSD3439	TO-202	NSP588	TO-220	NSP2093	TO-220	NSP5981	TO-220	TIP61B	TO-220	TN3724	TO-237
NSD3440	TO-202	NSP589	TO-220	NSP2100	TO-220	NSP5982	TO-220	TIP61C	TO-220	TN3725	TO-237
NSD6178	TO-202	NSP590	TO-220	NSP2101	TO-220	NSP5983	TO-220	TIP62	TO-220	TN3735	TO-237
NSD6179	TO-202	NSP595	TO-220	NSP2102	TO-220	NSP5984	TO-220	TIP62A	TO-220	TN4033	TO-237
NSD6180	TO-202	NSP596	TO-220	NSP2103	TO-220	NSP5985	TO-220	TIP62B	TO-220	TN4036	TO-237
NSD6181	TO-202	NSP597	TO-220	NSP2370	TO-220	SE9300	TO-220	TIP62C	TO-220	TN4037	TO-237
NSE170	TO-202	NSP598	TO-220	NSP2480	TO-220	SE9301	TO-220	TIP100	TO-220		

SUBSTITUTION GUIDE FOR NON-LISTED PART TYPES

Industry Part No.	Package	NSC Part No.	Package
2N2102	TO-39	TN2102	TO-237
2N2218A	TO-18	TN2218A	TO-237
2N2219A	TO-18	TN2219A	TO-237
2N2905	TO-18	TN2905	TO-237
2N3019	TO-39	TN3019	TO-237
2N3020	TO-39	TN3020	TO-237
2N3053	TO-39	TN3053	TO-237
2N3054	TO-66	NSP3054	TO-220
2N3724	TO-39	TN3724	TO-237
2N3725	TO-39	TN3725	TO-237

Industry Part No.	Package	NSC Part No.	Package
2N3735	TO-39	TN3735	TO-237
2N3740	TO-66	NSP3740	TO-220
2N3741	TO-66	NSP3741	TO-220
2N4033	TO-39	TN4033	TO-237
2N4037	TO-39	TN4037	TO-237
2N4063	TO-37	MJE3439	TO-126
2N4064	TO-37	MJE3440	TO-126
2N4918	TO-126	2N4918	TO-126
2N4919	TO-126	2N4919	TO-126
2N4920	TO-126	2N4920	TO-126

Industry Part No.	Package	NSC Part No.	Package
2N4921	TO-126	2N4921	TO-126
2N4922	TO-126	2N4922	TO-126
2N4923	TO-126	2N4923	TO-126
2N5190	TO-126	2N5190	TO-126
2N5191	TO-126	2N5191	TO-126
2N5192	TO-126	2N5192	TO-126
2N5193	TO-126	2N5193	TO-126
2N5194	TO-126	2N5194	TO-126
2N5195	TO-126	2N5195	TO-126
2N5293	TO-220	2N5293	TO-220

SUBSTITUTION GUIDE FOR NON-LISTED PART TYPES (Continued)

Industry Part No.	Package	NSC Part No.	Package
2N5294	TO-220	2N5294	TO-220
2N5295	TO-220	2N5295	TO-220
2N5296	TO-220	2N5296	TO-220
2N5297	TO-220	2N5297	TO-220
2N5298	TO-220	2N5298	TO-220
2N5490	TO-220	2N5490	TO-220
2N5491	TO-220	2N5491	TO-220
2N5492	TO-220	2N5492	TO-220
2N5493	TO-220	2N5493	TO-220
2N5494	TO-220	2N5494	TO-220
2N5495	TO-220	2N5495	TO-220
2N5496	TO-220	2N5496	TO-220
2N5497	TO-220	2N5497	TO-220
2N5974	TO-127	NSP5974	TO-220
2N5975	TO-127	NSP975	TO-220
2N5976	TO-127	NSP5976	TO-220
2N5977	TO-127	NSP5977	TO-220
2N5978	TO-127	NSP5978	TO-220
2N5979	TO-127	NSP5979	TO-220
2N6034	TO-126	2N6034	TO-220
2N6035	TO-126	2N6035	TO-126
2N6036	TO-126	2N6036	TO-126
2N6037	TO-126	2N6037	TO-126

Industry Part No.	Package	NSC Part No.	Package
2N6176	Plastic TO-5	2N5656	TO-126
2N6177	Plastic TO-5	2N5657	TO-126
2N6178	Plastic TO-5	MJE182	TO-126
2N6179	Plastic TO-5	MJE181	TO-126
2N6180	Plastic TO-5	MJE172	TO-126
2N6181	Plastic TO-5	MJE171	TO-126
2N6288	TO-220	2N6288	TO-220
2N6289	TO-220	2N6289	TO-220
2N6290	TO-220	2N6290	TO-220
2N6291	TO-220	2N6290	TO-220
2N6292	TO-220	2N6292	TO-220
2N6293	TO-220	2N6292	TO-220
2N6386	TO-220	2N6386	TO-220
2N6387	TO-220	2N6387	TO-220
2N6388	TO-220	2N6388	TO-220
2N6406	TO-126 (rev)	MJE171	TO-126
2N6407	TO-126 (rev)	MJE172	TO-126
2N6408	TO-126 (rev)	MJE181	TO-126
2N6409	TO-126 (rev)	MJE182	TO-126
2N6412	TO-126 (rev)	MJE180	TO-126
2N6413	TO-126 (rev)	MJE181	TO-126
2N6414	TO-126 (rev)	MJE170	TO-126
2N6415	TO-126 (rev)	MJE171	TO-126

Industry Part No.	Package	NSC Part No.	Package
92PU200	TO-237	2N6732	TO-237
92PU36	TO-237	2N6720	TO-237
92PU36A	TO-237	2N6721	TO-237
92PU36B	TO-237	2N6722	TO-237
92PU36C	TO-237	2N6723	TO-237
92PU391	TO-237	2N6733	TO-237
92PU392	TO-237	2N6734	TO-237
92PU393	TO-237	2N6735	TO-237
92PU45	TO-237	2N6724	TO-237
92PU45A	TO-237	2N6725	TO-237
92PU51	TO-237	2N6726	TO-237
92PU51A	TO-237	2N6727	TO-237
92PU55	TO-237	2N6728	TO-237
92PU56	TO-237	2N6729	TO-237
92PU57	TO-237	2N6730	TO-237
BD575	Mot Case 199	NSP575	TO-220
BD576	Mot Case 199	NSP576	TO-220
BD577	Mot Case 199	NSP577	TO-220
BD578	Mot Case 199	NSP578	TO-220
BD579	Mot Case 199	NSP578	TO-220
BD580	Mot Case 199	NSP580	TO-220
BD581	Mot Case 199	NSP581	TO-220
BD582	Mot Case 199	NSP582	TO-220

2N6041	Mot Case 199	TIP126	TO-220	2N6488	TO-220	2N6488	TO-220	BD588	Mot Case 199	NSP588	TO-220
2N6042	Mot Case 199	TIP127	TO-220	2N6489	TO-220	2N6489	TO-220	BD589	Mot Case 199	NSP589	TO-220
2N6043	Mot Case 199	TIP120	TO-220	2N6490	TO-220	2N6490	TO-220	BD590	Mot Case 199	NSP590	TO-220
2N6044	Mot Case 199	TIP121	TO-220	2N6491	TO-220	2N6491	TO-220	BD595	Mot Case 199	NSP595	TO-220
2N6045	Mot Case 199	TIP122	TO-220	2N6548	TO-202	2N6548	TO-202	BD596	Mot Case 199	NSP596	TO-220
2N6098	TO-220	2N6099	TO-220	2N6549	TO-202	2N6549	TO-202	BD597	Mot Case 199	NSP597	TO-220
2N6100	TO-220	2N6101	TO-220	2N6551	TO-202	2N6551	TO-202	BD601	Mot Case 199	NSP601	TO-220
2N6101	TO-220	2N6101	TO-220	2N6552	TO-202	2N6552	TO-202	BD602	Mot Case 199	NSP602	TO-220
2N6102	TO-220	2N6102	TO-220	2N6553	TO-202	2N6553	TO-202	BD603	Mot Case 199	NSP603	TO-220
2N6103	TO-220	2N6103	TO-220	2N6554	TO-202	2N6554	TO-202	BD604	Mot Case 199	NSP604	TO-220
2N6106	TO-220	2N6107	TO-220	2N6555	TO-202	2N6555	TO-202	BD605	Mot Case 199	NSP605	TO-220
2N6108	TO-220	2N6109	TO-220	2N6556	TO-202	2N6556	TO-202	BD606	Mot Case 199	NSP606	TO-220
2N6109	TO-220	2N6109	TO-220	92PE37A	TO-237	2N6705	TO-202	BD607	Mot Case 199	NSP607	TO-220
2N6110	TO-220	2N6111	TO-220	92PE37B	TO-237	2N6706	TO-237	BD608	Mot Case 199	NSP607	TO-220
2N6111	TO-220	2N6111	TO-220	92PE37C	TO-237	2N6707	TO-237	BD609	Mot Case 199	NSP609	TO-220
2N6121	TO-220	2N6121	TO-220	92PE487	TO-237	2N6711	TO-237	BD610	Mot Case 199	NSP610	TO-220
2N6122	TO-220	2N6122	TO-220	92PE488	TO-237	2N6712	TO-237	BD695	Mot Case 199	NSP695	TO-220
2N6123	TO-220	2N6123	TO-220	92PE489	TO-237	2N6713	TO-237	BD695A	Mot Case 199	NSP695A	TO-220
2N6124	TO-220	2N6124	TO-220	92PE77A	TO-237	2N6708	TO-237	BD700	Mot Case 199	NSP700	TO-220
2N6125	TO-220	2N6125	TO-220	92PE77B	TO-237	2N6798	TO-237	BD700A	Mot Case 199	NSP700A	TO-220
2N6126	TO-220	2N6126	TO-220	92PE77C	TO-237	2N6710	TO-237	BD701	Mot Case 199	NSP701	TO-220
2N6129	TO-220	2N6129	TO-220	92PU01	TO-237	2N6714	TO-237	BD702	Mot Case 199	NSP702	TO-220
2N6130	TO-220	2N6130	TO-220	92PE01A	TO-237	2N6715	TO-237	D40C1	TO-202	D40C1	TO-202
2N6131	TO-220	2N6131	TO-220	92PU05	TO-237	2N6716	TO-237	D40C2	TO-202	D40C2	TO-202
2N6132	TO-220	2N6132	TO-220	92PU06	TO-237	2N6717	TO-237	D40C3	TO-202	D40C3	TO-202
2N6133	TO-220	2N6133	TO-220	92PU07	TO-237	2N6718	TO-237	D40C4	TO-202	D40C4	TO-202
2N6134	TO-220	2N6134	TO-220	92PU10	TO-237	2N6719	TO-237	D40C5	TO-202	D40C5	TO-202
2N6175	Plastic TO-5	2N5656	TO-126	92PU100	TO-237	2N6731	TO-237	D40C7	TO-202	D40C7	TO-202

SUBSTITUTION GUIDE FOR NON-LISTED PART TYPES (Continued)

Industry Part No.	Package	NSC Part No.	Package
D40C8	TO-202	D40C8	TO-202
D40D1	TO-202	D40D1	TO-202
D40D2	TO-202	D40D2	TO-202
D40D3	TO-202	D40D3	TO-202
D40D4	TO-202	D40D4	TO-202
D40D5	TO-202	D40D5	TO-202
D40D7	TO-202	D40D7	TO-202
D40D8	TO-202	D40D8	TO-202
D40D10	TO-202	D40D10	TO-202
D40D11	TO-202	D40D11	TO-202
D40D13	TO-202	D40D13	TO-202
D40D14	TO-202	D40D14	TO-202
D40E1	TO-202	D40E1	TO-202
D40E5	TO-202	D40E5	TO-202
D40E7	TO-202	D40E7	TO-202
D40K1	TO-202	D40K1	TO-202
D40K2	TO-202	D40K2	TO-202
D40N1	TO-202	D40N1	TO-202
D40N2	TO-202	D40N2	TO-202
D40P1	TO-202	D40P1	TO-202
D40P3	TO-202	D40P3	TO-202
D40P5	TO-202	D40P5	TO-202
D41D1	TO-202	D41D1	TO-202
D41D2	TO-202	D41D2	TO-202

Industry Part No.	Package	NSC Part No.	Package
D43C5	TO-202	D43C5	TO-202
D43C6	TO-202	D43C6	TO-202
D43C7	TO-202	D43C7	TO-202
D43C8	TO-202	D43C8	TO-202
D43C9	TO-202	D43C9	TO-202
D43C10	TO-202	D43C10	TO-202
D43C11	TO-202	D43C11	TO-202
D43C12	TO-202	D43C12	TO-202
D44C1	TO-220	D44C1	TO-220
D44C2	TO-220	D44C2	TO-220
D44C3	TO-220	D44C3	TO-220
D44C4	TO-220	D44C4	TO-220
D44C5	TO-220	D44C5	TO-220
D44C6	TO-220	D44C6	TO-220
D44C7	TO-220	D44C7	TO-220
D44C8	TO-220	D44C8	TO-220
D44C9	TO-220	D44C9	TO-220
D44C10	TO-220	D44C10	TO-220
D44C11	TO-220	D44C11	TO-220
D44C12	TO-220	D44C12	TO-220
D44H2	TO-220	D44H2	TO-220
D44H4	TO-220	D44H4	TO-220
D44H5	TO-220	D44H5	TO-220
D44H7	TO-220	D44H7	TO-220

Industry Part No.	Package	NSC Part No.	Package
MJE200	TO-126	MJE200	TO-126
MJE205	Mot Case 199	MJE205T	TO-220
MJE210	TO-126	MJE210	TO-126
MJE220	TO-126	MJE220	TO-126
MJE221	TO-126	MJE221	TO-126
MJE222	TO-126	MJE222	TO-126
MJE223	TO-126	MJE223	TO-126
MJE224	TO-126	MJE224	TO-126
MJE225	TO-126	MJE225	TO-126
MJE230	TO-126	MJE230	TO-126
MJE231	TO-126	MJE231	TO-126
MJE232	TO-126	MJE232	TO-126
MJE233	TO-126	MJE233	TO-126
MJE234	TO-126	MJE234	TO-126
MJE235	TO-126	MJE235	TO-126
MJE240	TO-126	MJE240	TO-126
MJE241	TO-126	MJE241	TO-126
MJE242	TO-126	MJE242	TO-126
MJE243	TO-126	MJE243	TO-126
MJE244	TO-126	MJE244	TO-126
MJE250	TO-126	MJE250	TO-126
MJE251	TO-126	MJE251	TO-126
MJE252	TO-126	MJE252	TO-126
MJE253	TO-126	MJE253	TO-126

D41D7	TO-202	D41D7	TO-202	D45C1	TO-220	D45C1	TO-220	MJE344	TO-126	MJE344	TO-126
D41D8	TO-202	D41D8	TO-202	D45C2	TO-220	D45C2	TO-220	MJE370	TO-126	MJE370	TO-126
D41D10	TO-202	D41D10	TO-202	D45C3	TO-220	D45C3	TO-220	MJE370K	Mot Case 199	NSP370	TO-220
D41D11	TO-202	D41D11	TO-202	D45C4	TO-220	D45C4	TO-220	MJE371	TO-126	MJE371	TO-126
D41D13	TO-202	D41D13	TO-202	D45C5	TO-220	D45C5	TO-220	MJE371K	Mot Case 199	NSP371	TO-220
D41D14	TO-202	D41D14	TO-202	D45C6	TO-220	D45C6	TO-220	MJE520	TO-126	MJE520	TO-126
D41E1	TO-202	D41E1	TO-202	D45C7	TO-220	D45C7	TO-220	MJE521	TO-126	MJE521	TO-126
D41E5	TO-202	D41E5	TO-202	D45C8	TO-220	D45C8	TO-220	MJE700	TO-126	MJE700	TO-126
D41E7	TO-202	D41E7	TO-202	D45C9	TO-220	D45C9	TO-220	MJE701	TO-126	MJE701	TO-126
D41K1	TO-202	D41K1	TO-202	D45C10	TO-220	D45C10	TO-220	MJE702	TO-126	MJE702	TO-126
D41K2	TO-202	D41K2	TO-202	D45C11	TO-220	D45C11	TO-220	MJE703	TO-126	MJE703	TO-126
D42C1	TO-202	D42C1	TO-202	D45C12	TO-220	D45C12	TO-220	MJE710	TO-126	MJE710	TO-126
D42C2	TO-202	D42C2	TO-202	D45H1	TO-220	D45H1	TO-220	MJE711	TO-126	MJE711	TO-126
D42C3	TO-202	D42C3	TO-202	D45H2	TO-220	D45H2	TO-220	MJE712	TO-126	MJE712	TO-126
D42C4	TO-202	D42C4	TO-202	D45H4	TO-220	D45H4	TO-220	MJE720	TO-126	MJE720	TO-126
D42C5	TO-202	D42C5	TO-202	D45H5	TO-220	D45H5	TO-220	MJE721	TO-126	MJE721	TO-126
D42C6	TO-202	D42C6	TO-202	D45H7	TO-220	D45H7	TO-220	MJE722	TO-126	MJE722	TO-126
D42C7	TO-202	D42C7	TO-202	D45H8	TO-220	D45H8	TO-220	MJE800	TO-126	MJE800	TO-126
D42C8	TO-202	D42C8	TO-202	D45H10	TO-220	D45H10	TO-220	MJE801	TO-126	MJE801	TO-126
D42C9	TO-202	D42C9	TO-202	D45H11	TO-220	D45H11	TO-220	MJE802	TO-126	MJE802	TO-126
D42C10	TO-202	D42C10	TO-202	MJE105	Mot Case 199	MJE105T	TO-220	MJE803	TO-126	MJE803	TO-126
D42C11	TO-202	D42C11	TO-202	MJE170	TO-126	MJE170	TO-126	MJE2010	Mot Case 199	NSP2010	TO-220
D42C12	TO-202	D42C12	TO-202	MJE171	TO-126	MJE171	TO-126	MJE2011	Mot Case 199	NSP2011	TO-220
D43C1	TO-202	D43C1	TO-202	MJE172	TO-126	MJE172	TO-126	MJE2020	Mot Case 199	NSP2020	TO-220
D43C2	TO-202	D43C2	TO-202	MJE180	TO-126	MJE180	TO-126	MJE2021	Mot Case 199	NSP2021	TO-220
D43C3	TO-202	D43C3	TO-202	MJE181	TO-126	MJE181	TO-126	MJE2090	Mot Case 199	NSP2090	TO-220
D43C4	TO-202	D43C4	TO-202	MJE182	TO-126	MJE182	TO-126	MJE2091	Mot Case 199	NSP2091	TO-220

SUBSTITUTION GUIDE FOR NON-LISTED PART TYPES (Continued)

Industry Part No.	Package	NSC Part No.	Package
MJE2092	Mot Case 199	NSP2092	TO-220
MJE2093	Mot Case 199	NSP2093	TO-220
MJE2100	Mot Case 199	NSP2100	TO-220
MJE2101	Mot Case 199	NSP2101	TO-220
MJE2102	Mot Case 199	NSP2102	TO-220
MJE2103	Mot Case 199	NSP2103	TO-220
MJE2370	Mot Case 199	NSP2370	TO-220
MJE2490	Mot Case 199	NSP2490	TO-220
MJE2491	Mot Case 199	NSP2491	TO-220
MJE2520	Mot Case 199	NSP2520	TO-220
MJE2801K	Mot Case 199	MJE2801T	TO-220
MJE2801T	TO-220	MJE2801T	TO-220
MJE2901K	Mot Case 199	MJE2901T	TO-220
MJE2901T	TO-220	MJE2901T	TO-220
MJE2955K	Mot Case 199	MJE2955T	TO-220
MJE2955T	TO-220	MJE2955T	TO-220
MJE3055K	Mot Case 199	MJE3055T	TO-220
MJE3055T	TO-220	MJE3055T	TO-220
MJE3439	TO-126	MJE3439	TO-126
MJE3440	TO-126	MJE3440	TO-126
MJE5974	Mot Case 199	NSP5974	TO-220
MJE5975	Mot Case 199	NSP5975	TO-220
MJE5976	Mot Case 199	NSP5976	TO-220

Industry Part No.	Package	NSC Part No.	Package
MPSU51	Mot 152	2N6726	TO-237
MPSU51A	Mot 152	NSDU51A	TO-202
MPSU51A	Mot 152	2N6727	TO-237
MPSU52	Mot 152	NSPU52	TO-202
MPSU52	Mot 152	2N6727	TO-237
MPSU55	Mot 152	NSDU55	TO-202
MPSU55	Mot 152	2N6728	TO-237
MPSU56	Mot 152	NSDU56	TO-202
MPSU56	Mot 152	2N6729	TO-237
MPSU57	Mot 152	NSDU57	TO-202
MPSU57	Mot 152	2N6730	TO-237
NSDU01	TO-202	NSDU01	TO-202
NSDU01A	TO-202	NSDU01A	TO-202
NSDU02	TO-202	NSDU02	TO-202
NSDU05	TO-202	NSDU05	TO-202
NSDU06	TO-202	NSDU06	TO-202
NSDU07	TO-202	NSDU07	TO-202
NSDU10	TO-202	NSDU10	TO-202
NSDU45	TO-202	NSDU45	TO-202
NSDU45A	TO-202	NSDU45A	TO-202
NSDU51	TO-202	NSDU51	TO-202
NSDU51A	TO-202	NSDU51A	TO-202
NSDU52	TO-202	NSDU52	TO-202

Industry Part No.	Package	NSC Part No.	Package
NSD3439	TO-202	NSD3439	TO-202
NSD3440	TO-202	NSD3440	TO-202
NSD6178	TO-202	NSD6178	TO-202
NSD6179	TO-202	NSD6179	TO-202
NSD6180	TO-202	NSD6180	TO-202
NSD6181	TO-202	NSD6181	TO-202
NSE170	TO-202	NSE170	TO-202
NSE171	TO-202	NSE171	TO-202
NSE180	TO-202	NSE180	TO-202
NSE181	TO-202	NSE181	TO-202
NSE457	TO-202	NSE457	TO-202
NSE458	TO-202	NSE458	TO-202
NSE459	TO-202	NSE459	TO-202
NSP41	TO-220	NSP41	TO-220
NSP41A	TO-220	NSP41A	TO-220
NSP41B	TO-220	NSP41B	TO-220
NSP41C	TO-220	NSP41C	TO-220
NSP42	TO-220	NSP42	TO-220
NSP42A	TO-220	NSP42A	TO-220
NSP42B	TO-220	NSP42B	TO-220
NSP42C	TO-220	NSP42C	TO-220
NSP121	TO-220	NSP121	TO-220
NSP370	TO-220	NSP370	TO-220

MJE5980	Mot Case 199	NSP5980	TO-220	NSD36	TO-202	NSD36	TO-202	NSP575	TO-220	NSP575	TO-220
MJE5981	Mot Case 199	NSP5981	TO-220	NSD36A	TO-202	NSD36A	TO-202	NSP576	TO-220	NSP576	TO-220
MJE5982	Mot Case 199	NSP5982	TO-220	NSD36B	TO-202	NSD36B	TO-202	NSP577	TO-220	NSP577	TO-220
MJE5983	Mot Case 199	NSP5983	TO-220	NSD36C	TO-202	NSD36C	TO-202	NSP578	TO-220	NSP578	TO-220
MJE5984	Mot Case 199	NSP5984	TO-220	NSD102	TO-202	NSD102	TO-202	NSP579	TO-220	NSP579	TO-220
MJE5985	Mot Case 199	NSP5985	TO-220	NSD103	TO-202	NSD103	TO-202	NSP580	TO-220	NSP580	TO-220
MPSU01	Mot 152	NSDU01	TO-202	NSD104	TO-202	NSD104	TO-202	NSP581	TO-220	NSP581	TO-220
MPSU01	Mot 152	2N6714	TO-237	NSD105	TO-202	NSD105	TO-202	NSP582	TO-220	NSP582	TO-220
MPSU01A	Mot 152	NSDU01A	TO-202	NSD106	TO-202	NSD106	TO-202	NSP585	TO-220	NSP585	TO-220
MPSU01A	Mot 152	2N6715	TO-237	NSD123	TO-202	NSD123	TO-202	NSP586	TO-220	NSP586	TO-220
MPSU02	Mot 152	NSDU02	TO-202	NSD127	TO-202	NSD127	TO-202	NSP587	TO-220	NSP587	TO-220
MPSU02	Mot 152	TN2219A	TO-237	NSD131	TO-202	NSD131	TO-202	NSP588	TO-220	NSP588	TO-220
MPSU03	Mot 152	2N6733	TO-237	NSD132	TO-202	NSD132	TO-202	NSP589	TO-220	NSP589	TO-220
MPSU04	Mot 152	2N6733	TO-237	NSD133	TO-202	NSD133	TO-202	NSP590	TO-220	NSP590	TO-220
MPSU05	Mot 152	NSDU05	TO-202	NSD134	TO-202	NSD134	TO-202	NSP595	TO-220	NSP595	TO-220
MPSU05	Mot 152	2N6716	TO-237	NSD135	TO-202	NSD135	TO-202	NSP596	TO-220	NSP596	TO-220
MPSU06	Mot 152	NSDU06	TO-202	NSD151	TO-202	NSD151	TO-202	NSP597	TO-220	NSP597	TO-220
MPSU06	Mot 152	2N6717	TO-237	NSD152	TO-202	NSD152	TO-202	NSP598	TO-220	NSP598	TO-220
MPSU07	Mot 152	NSDU07	TO-202	NSD153	TO-202	NSD153	TO-202	NSP599	TO-220	NSP599	TO-220
MPSU07	Mot 152	2N6718	TO-237	NSD154	TO-202	NSD154	TO-202	NSP600	TO-220	NSP600	TO-220
MPSU10	Mot 152	NSDU10	TO-202	NSD202	TO-202	NSD202	TO-202	NSP601	TO-220	NSP601	TO-220
MPSU10	Mot 152	2N6719	TO-237	NSD203	TO-202	NSD203	TO-202	NSP602	TO-220	NSP602	TO-220
MPSU31	Mot 152	TN2102	TO-237	NSD204	TO-202	NSD204	TO-202	NSP605	TO-220	NSP605	TO-220
MPSU45	Mot 152	NSDU45	TO-202	NSD205	TO-202	NSD205	TO-202	NSP607	TO-220	NSP607	TO-220
MPSU45	Mot 152	2N6724	TO-237	NSD206	TO-202	NSD206	TO-202	NSP608	TO-220	NSP608	TO-220
MPSU45A	Mot 152	NSDU45A	TO-202	NSD457	TO-202	NSD457	TO-202	NSP609	TO-220	NSP609	TO-220
MPSU45A	Mot 152	2N6725	TO-237	NSD458	TO-202	NSD458	TO-202	NSP610	TO-220	NSP610	TO-220
MPSU51	Mot 152	NSDU51	TO-202	NSD459	TO-202	NSD459	TO-202	NSP695	TO-220	NSP695	TO-220

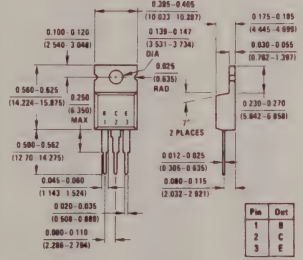
SUBSTITUTION GUIDE FOR NON-LISTED PART TYPES (Continued)

Industry Part No.	Package	NSC Part No.	Package
NSP695A	TO-220	NSP695A	TO-220
NSP696	TO-220	NSP696	TO-220
NSP696A	TO-220	NSP696A	TO-220
NSP697	TO-220	NSP697	TO-220
NSP697A	TO-220	NSP697A	TO-220
NSP698	TO-220	NSP698	TO-220
NSP698A	TO-220	NSP698A	TO-220
NSP699	TO-220	NSP699	TO-220
NSP699A	TO-220	NSP699A	TO-220
NSP700	TO-220	NSP700	TO-220
NSP700A	TO-220	NSP700A	TO-220
NSP701	TO-220	NSP701	TO-220
NSP702	TO-220	NSP702	TO-220
NSP2010	TO-220	NSP2010	TO-220
NSP2011	TO-220	NSP2011	TO-220
NSP2020	TO-220	NSP2020	TO-220
NSP2021	TO-220	NSP2021	TO-220
NSP2090	TO-220	NSP2090	TO-220
NSP2091	TO-220	NSP2091	TO-220
NSP2092	TO-220	NSP2092	TO-220
NSP2093	TO-220	NSP2093	TO-220
NSP2100	TO-220	NSP2100	TO-220
NSP2101	TO-220	NSP2101	TO-220
NSP5192	TO-220	NSP5192	TO-220
NSP5193	TO-220	NSP5193	TO-220
NSP5194	TO-220	NSP5194	TO-220
NSP5195	TO-220	NSP5195	TO-220
NSP5974	TO-220	NSP5974	TO-220
NSP5975	TO-220	NSP5975	TO-220
NSP5976	TO-220	NSP5976	TO-220
NSP5977	TO-220	NSP5977	TO-220
NSP5978	TO-220	NSP5978	TO-220
NSP5979	TO-220	NSP5979	TO-220
NSP5980	TO-220	NSP5980	TO-220
NSP5981	TO-220	NSP5981	TO-220
NSP5982	TO-220	NSP5982	TO-220
NSP5983	TO-220	NSP5983	TO-220
NSP5984	TO-220	NSP5984	TO-220
NSP5985	TO-220	NSP5985	TO-220
SE9300	TO-220	SE9300	TO-220
SE9301	TO-220	SE9301	TO-220
SE9302	TO-220	SE9302	TO-220
SE9400	TO-220	SE9400	TO-220
SE9401	TO-220	SE9401	TO-220
SE9402	TO-220	SE9402	TO-220
TIP29	TO-220	TIP29	TO-220
TIP61	TO-220	TIP61	TO-220
TIP61A	TO-220	TIP61A	TO-220
TIP61B	TO-220	TIP61B	TO-220
TIP61C	TO-220	TIP61C	TO-220
TIP62	TO-220	TIP62	TO-220
TIP62A	TO-220	TIP62A	TO-220
TIP62B	TO-220	TIP62B	TO-220
TIP62C	TO-220	TIP62C	TO-220
TIP100	TO-220	TIP100	TO-220
TIP101	TO-220	TIP101	TO-220
TIP102	TO-220	TIP102	TO-220
TIP105	TO-220	TIP105	TO-220
TIP106	TO-220	TIP106	TO-220
TIP107	TO-220	TIP107	TO-220
TIP115	TO-220	TIP115	TO-220
TIP116	TO-220	TIP116	TO-220
TIP117	TO-220	TIP117	TO-220
TIP120	TO-220	TIP120	TO-220
TIP121	TO-220	TIP121	TO-220
TIP122	TO-220	TIP122	TO-220
TIP125	TO-220	TIP125	TO-220
TIP126	TO-220	TIP126	TO-220
TIP127	TO-220	TIP127	TO-220

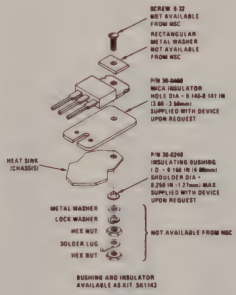
NSP2480	TO-220	NSP2480	TO-220	TIP30	TO-220	TIP30	TO-220	TIP135	TO-220	TIP135	TO-220
NSP2481	TO-220	NSP2481	TO-220	TIP30A	TO-220	TIP30A	TO-220	TIP136	TO-220	TIP137	TO-220
NSP2482	TO-220	NSP2482	TO-220	TIP30B	TO-220	TIP30B	TO-220	TN2102	TO-237	TN2102	TO-237
NSP2483	TO-220	NSP2483	TO-220	TIP30C	TO-220	TIP30C	TO-220	TN2218A	TO-237	TN2218A	TO-237
NSP2490	TO-220	NSP2490	TO-220	TIP31	TO-220	TIP31	TO-220	TN2219	TO-237	TN2219	TO-237
NSP2491	TO-220	NSP2491	TO-220	TIP31A	TO-220	TIP31A	TO-220	TN2219A	TO-237	TN2219A	TO-237
NSP2520	TO-220	NSP2520	TO-220	TIP31B	TO-220	TIP31B	TO-220	TN2904A	TO-237	TN2904A	TO-237
NSP2955	TO-220	NSP2955	TO-220	TIP31C	TO-220	TIP31C	TO-220	TN2905	TO-237	TN2905	TO-237
NSP3054	TO-220	NSP3054	TO-220	TIP32	TO-220	TIP32	TO-220	TN2905A	TO-237	TN2905A	TO-237
NSP3055	TO-220	NSP3055	TO-220	TIP32A	TO-220	TIP32A	TO-220	TN3019	TO-237	TN3019	TO-237
NSP3740	TO-220	NSP3740	TO-220	TIP32B	TO-220	TIP32B	TO-220	TN3020	TO-237	TN3020	TO-237
NSP3741	TO-220	NSP3741	TO-220	TIP32C	TO-220	TIP32C	TO-220	TN3053	TO-237	TN3053	TO-237
NSP4918	TO-220	NSP4918	TO-220	TIP41	TO-220	TIP41	TO-220	TN3724	TO-237	TN3724	TO-237
NSP4919	TO-220	NSP4919	TO-220	TIP41A	TO-220	TIP41A	TO-220	TN3725	TO-237	TN3725	TO-237
NSP4920	TO-220	NSP4920	TO-220	TIP41B	TO-220	TIP41B	TO-220	TN3735	TO-237	TN3735	TO-237
NSP4921	TO-220	NSP4921	TO-220	TIP41C	TO-220	TIP41C	TO-220	TN4033	TO-237	TN4033	TO-237
NSP4922	TO-220	NSP4922	TO-220	TIP42	TO-220	TIP42	TO-220	TN4036	TO-237	TN4036	TO-237
NSP4923	TO-220	NSP4923	TO-220	TIP42A	TO-220	TIP42A	TO-220	TN4037	TO-237	TN4037	TO-237
NSP5190	TO-220	NSP5190	TO-220	TIP42B	TO-220	TIP42B	TO-220				
NSP5191	TO-220	NSP5191	TO-220	TIP42C	TO-220	TIP42C	TO-220				

TO-220 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS

Package Dimensions



Mounting Technique



Package Thermal Characteristics

Max P_d = 75W @ T_C = 25°C
= 2W @ T_A = 25°C

O_{JC} = 1.8 to 6.2°C/W
(chip size dependent)

T_J = −65 to +150°C

ELECTRICAL CHARACTERISTICS

Part Number NPN	Part Number PNP	I_C (A)	V_{CEO} (V)	h_{FE} Min	h_{FE} Max	@ I_C(A)	@ V_{CE}(V)	MAX $V_{CE(SAT)}$ (V)	@ I_C(A)	P_D (W)	f_T (MHz)	Process (NPN/PNP)
TIP61	TIP62	0.5	40	15	100	0.5	4	0.7	0.5	20	3	4F/5F
TIP61A	TIP62A	0.5	60	15	100	0.5	4	0.7	0.5	20	3	4F/5F
TIP61B	TIP62B	0.5	80	15	100	0.5	4	0.7	0.5	20	3	4F/5F
TIP61C	TIP62C	0.5	100	15	100	0.5	4	0.7	0.5	20	3	4F/5F

TIP29C	TIP30C	1	100	15	75	1	4	0.7	1	30	3	4F/5F
TIP110	TIP115	2	60	1000		1	4	2.5	2	50	1	4J/5J
TIP111	TIP116	2	80	1000		1	4	2.5	2	50	1	4J/5J
TIP112	TIP117	2	100	1000		1	4	2.5	2	50	1	4J/5J
TIP31	TIP32	3	40	10	50	3	4	1.2	3	40	3	4F/5F
TIP31A	TIP32A	3	60	10	50	3	4	1.2	3	40	3	4F/5F
TIP31B	TIP32B	3	80	10	50	3	4	1.2	3	40	3	4F/5F
TIP31C	TIP32C	3	100	10	50	3	4	0.2	3	40	3	4F/5F
D44C1	D45C1	3	30	25		0.2	1	0.5	1	30	50	4P/5P
D44C2	D45C2	3	30	100	220	0.2	1	0.5	1	30	50	4P/5P
D44C3	D45C3	3	30	40	120	0.2	1	0.5	1	30	50	4P/5P
2N5296		4	40	30	120	1	4	1	1	36	2	4E
D44C4	D45C4	3	45	25		0.2	1	0.5	1	30	50	4P/5P
D44C5	D45C5	3	45	100	220	0.2	1	0.5	1	30	50	4P/5P
D44C6	D45C6	3	45	40	120	0.2	1	0.5	1	30	50	4P/5P
2N6121	2N6124	4	45	25	100	1.5	2	0.6	1.5	40	2.5	4E/5E
D44C7	D45C7	3	60	25		0.2	1	0.5	1	30	50	4P/5P
D44C8	D45C8	3	60	100	220	0.2	1	0.5	1	30	50	4P/5P
D44C9	D45C9	3	60	40	120	0.2	1	0.5	1	30	50	4P/5P
2N5298		4	60	20	80	1.5	4	1	1.5	36	2	4E
2N6122	2N6125	4	60	25	100	1.5	2	0.6	1.5	40	2.5	4E/5E
2N5294		4	70	30	120	0.5	4	1	0.5	36	2	4E
D44C10	D45C10	3	80	25		0.2	1	0.5	1	30	50	4P/5P
D44C11	D45C11	3	80	100	220	0.2	1	0.5	1	30	50	4P/5P
D44C12	D45C12	3	80	40	120	0.2	1	0.5	1	30	50	4P/5P
2N6123	2N6126	4	80	20	80	1.5	2	0.6	1.5	40	2.5	4E/5E
MJE105T	MJE205T	5	50	25	100	2	2			65		4A/5A
TIP120	TIP125	5	60	1000		3	3	2	3	65	1	4J/5K
TIP121	TIP126	5	80	1000		3	3	2	3	65	1	4K/5K
TIP122	TIP127	5	100	1000		3	3	2	3	65	1	4K/5K
TIP41	TIP42	6	40	15	75	3	4	1.5	6	65	3	4A/5A
TIP41A	TIP42A	6	60	15	75	3	4	1.5	6	65	3	4A/5A

TO-220 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS (Continued)

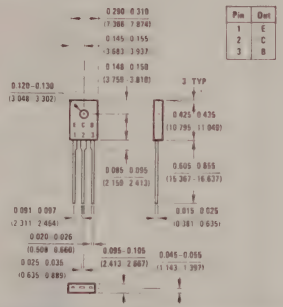
ELECTRICAL CHARACTERISTICS

Part Number		I_C	V_{CEO}	h_{FE}		@		MAX $V_{CE(SAT)}$		P_D	f_T	Process
NPN	PNP	(A)	(V)	Min	Max	I_C(A)	V_{CE}(V)	(V)	@ I_C(A)	(W)	(MHz)	(NPN/PNP)
TIP130	TIP135	6	60	1000	15,000	4	4	2	4		1	4K/5K
TIP41B	TIP42B	6	80	15	75	3	4	1.5	6	65	3	4A/5A
TIP131	TIP136	6	80	1000	15,000	4	4	2	4		1	4K/5K
TIP41C	TIP42C	6	100	15	75	3	4	1.5	6	65	3	4A/5A
TIP132	TIP137	6	100	1000	15,000	4	4	2	4		1	4K/5K
2N6288	2N6111	7	30	30	150	3	4	1	3	40	4	4E/5E
2N5490		7	40	20	100	2	4	1	0.2	50	0.8	4E
2N5494		7	40	20	100	3	4	1	0.3	50	0.8	4E
2N6129	2N6132	7	40	20	100	2.5	4	1.4	7	50	2.5	4E/5E
2N6290	2N6109	7	50	30	150	2.5	4	1	2.5	40	4	4E/5E
2N5492		7	55	20	100	2.5	4	1	0.25	50	0.8	4E
2N6130	2N6133	7	60	20	100	2.5	4	1.4	7	50	2.5	4E/5E
2N5496		7	70	20	100	3.5	4	1	0.35	50	0.8	4E
2N6292	2N6107	7	70	30	150	2	4	1	2	40	4	4E/5E
2N6131	2N6134	7	80	20	100	2.5	4	2	7	50	2.5	4E/5E
2N6386		8	40	1000	20,000	3	3	2	3	40	20	4J
BD347	BD346	8	60	40	140	2	2.5	0.6	4	60	4	4A/5A
D44H1	D45H1	10	30	35		2	1	1	8	50	50	4Q/5Q
D44H2	D45H2	10	30	60		2	1	1	8	50	50	4Q/5Q
D44H4	D45H4	10	45	35		2	1	1	8	50	50	4Q/5Q
D44H5	D45H5	10	45	60		2	1	1	8	50	50	4Q/5Q
2N6099		10	60	20	80	4	4	2.5	10	75	0.8	4A
D44H7	D45H7	10	60	35		2	1	1	8	50	50	4Q/5Q
D44H8	D45H8	10	60	60		2	1	1	8	50	50	4Q/5Q
SE9300	SE9400	10	60	1000		4	3	2	4	70	1	4K/5K

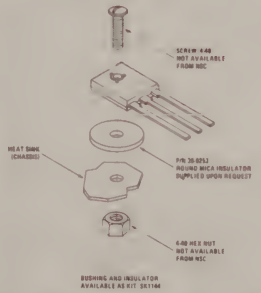
D44H11	D45H11	10	80	60		2	1	1	8	50	50	4Q/5Q
MJE2801T	MJE2901T	10	60	25	100	3	2			60		4A/5A
MJE3055T	MJE2955T	10	60	20	70	4	4	1.1	4	60	2	4A/5A
TIP100	TIP105	10	60	1000		3	4	2	3	60		4K/5K
TIP101	TIP106	10	80	1000		3	4	2	3	60		4K/5K
TIP102	TIP107	10	100	1000		3	4	2	3	60		4K/5K
SE9301	SE9401	10	80	1000		4	3	2	4	70	1	4K/5K
SE9302	SE9402	10	100	1000		4	3	2	4	70	1	4K/5K
2N6486	2N6489	15	40	20	150	5	4	1.3	5	75	5	4A/5A
2N6487	2N6490	15	60	20	150	5	4	1.3	5	75	5	4A/5A
2N6488	2N6491	15	80	20	150	5	4	1.3	5	75	5	4A/5A

TO-126 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS

Package Dimensions



Mounting Techniques



Package Thermal Characteristics

Max P_d = 40W @ T_C = 25°C
= 1.5W @ T_A = 25°C

O_{JC} = 3.1 to 8.3°C/W
(chip size dependent)

T_J = −65°C to +150°C

ELECTRICAL CHARACTERISTICS

Part Number NPN	Part Number PNP	I_C (A)	V_{CEO} (V)	h_{FE} Min	h_{FE} Max	@ I_C(A)	@ V_{CE}(V)	MAX $V_{CE(SAT)}$ (V)	@ I_C(A)	P_D (W)	f_T (MHz)	Process (NPN/PNP)
MJE3440		0.3	250	40	160	0.02	10	0.5	0.05	15	15	36
MJE3439		0.3	350	40	160	0.02	10	0.5	0.05	15	15	36
								1	0.05	20	15	36

2N5657		0.5	350	30	250	0.1	10	1	0.1	20	10	36
2N4921	2N4918	1	40	20	100	0.5	1	0.6	1	30	3	2C/3C
2N4922	2N4919	1	60	20	100	0.5	1	0.6	1	30	3	2C/3C
2N4923	2N4920	1	80	20	100	0.5	1	0.6	1	30	3	2C/3C
MJE720	MJE710	1.5	40	40		0.15	1	0.15	0.15	20		37/77
BD345	BD344	1.5	60	40	250	0.2	1	0.4	0.2	20	50	38/78
MJE721	MJE711	1.5	60	40		0.15	1	0.15	0.15	20		38/78
BD349	BD348	1.5	80	50	250	0.25	1	0.5	0.25	20	50	39/79
MJE722	MJE712	1.5	80	40		0.15	1	0.15	0.15	20		39/79
MJE520	MJE370	3	30	25		1	1			25		2C/3C
MJE180	MJE170	3	40	50	250	0.1	1	0.3	0.5	12.5	50	37/77
MJE181	MJE171	3	60	50	250	0.1	1	0.3	0.5	12.5	50	38/78
MJE182	MJE172	3	80	50	250	0.1	1	0.3	0.5	12.5	50	39/79
MJE220	MJE230	4	40	20		2	1	0.8	2	15	50	2P/3P
MJE221	MJE231	4	40	20		1	1	0.6	1	15	50	2P/3P
MJE222	MJE232	4	40	25		1	1	0.3	0.5	15	50	2P/3P
MJE521	MJE371	4	40	40		0.1	1			40		2C/3C
2N5190	2N5193	4	40	25	100	1.5	2	0.6	1.5	40	2	2E/3E
2N6037	2N6034	4	40	750	15k	2	3	2	2	40		2J/3J
2N5191	2N5194	4	60	25	100	1.5	2	0.6	1.5	40	2	2E/3E
MJE223	MJE233	4	60	20		2	1	0.8	2	15	50	2P/3P
MJE224	MJE234	4	60	20		1	1	0.6	1	15	50	2P/3P
MJE225	MJE235	4	60	25		1	1	0.3	0.5	15	50	2P/3P
MJE800	MJE700	4	60	750		1.5	3	2.5	1.5	40		2J/3J
MJE801	MJE701	4	60	750		2	3	2.8	2	40		2J/3J
2N6038	2N6035	4	60	750	15k	2	3	2	2	40		2J/3J
MJE240	MJE250	4	80	15		2	1	0.8	2	15	40	2P/3P
MJE241	MJE251	4	80	20		1	1	0.6	1	15	40	2P/3P
MJE242	MJE252	4	80	10		1	1	0.3	0.5	15	40	2P/3P
MJE802	MJE702	4	80	750		1.5	3	2.5	1.5	40		2J/3J
MJE803	MJE703	4	80	750		2	3	2.8	2	40		2J/3J

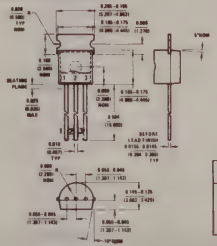
TO-126 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS (Continued)

ELECTRICAL CHARACTERISTICS (Continued)

Part Number		I_C	V_{CEO}	h_{FE}		@		MAX $V_{CE(SAT)}$		P_D	f_T	Process
NPN	PNP	(A)	(V)	Min	Max	I_C(A)	V_{CE}(V)	(V)	@ I_C(A)	(W)	(MHz)	(NPN/PNP)
2N5192	2N5195	4	80	20	80	1.5	2	0.6	1.5	40	2	2E/3E
2N6039	2N6036	4	80	750	15k	2	3	2	2	40		2J/3J
MJE243	MJE253	4	100	20		1	1	0.6	1	15	40	2P/3P
MJE244	MJE254	4	100	10		1	1	0.3	0.5	15	40	2P/3P
MJE200	MJE210	5	25	45	180	2	1	0.75	2	15	65	2P/3P

TO-237 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS

Package Dimensions



Pin	Package 90	Package 91
1	Base	Collector
2	Collector	Base
3	Emitter	Emitter

Mounting Techniques

Same as TO-92

Package Thermal Characteristics

Max P_d = 1.2 W @ T_A = 25°C

O_{JC} = 50°C/W

T_J = −65°C

Part Number		V_{CEO}	I_C	h_{FE}		@		MAX $V_{CE(SAT)}$	@		P_D	f_T	Process
NPN	PNP	(V)	(A)	Min	Max	I_C(mA)	V_{CE}(V)	(V)	@	I_C(mA)	(W)	(MHz)	(NPN/PNP)
TN2219		30	0.5	100	300	150	10	0.4		150	1.2	250	19
				30		500	10						
TN3724		30	1.5	60	150	100	1	0.2		100	1.2	300	25
				40		300	1	0.32		300			
92PU01/2N6714	92PU51/2N6726	30	2	60		100	1	0.5		1000	1.2	50	37/77
				55		1000	1						
TN2218A		40	0.5	40	120	150	10	0.3		150	1.2	250	19
				25		500	10						
TN2219A	TN2905	40	0.5	100	300	150	10	0.3/0.4		150	1.2	300	19/63
				40		500	10						
TN3053	TN4037	40	1	50	250	150	10	1.4		150	1.2	100	12/63
92PU01A/2N6715	92PU51A/2N6727	40	2	60		100	1	0.5		1000	1.2	50	37/77
				55		1000	1						
92PU45/2N6724		40	2	25k		200	5	1		200	1.2	100	05
				4k		1000	5	1.5		1000			
92PE37A/2N6705	92PE77A/2N6708	45	2	40		500	2	0.5		500	1.2	50	38/78
TN3725		50	1	60	150	100	1	0.4		300	1.2	300	25
				40		300							
92PU45A/2N6725		50	2	25k		200	5	1		200	1.2	100	05
				4k		1000	5	1.5		1000			
	TN2904A	60	0.5	40	120	150	10	0.4		150	1.2	200	63
				40		500	10						
	TN2905A	60	0.5	100	300	150	10	0.4		150	1.2	200	63
				50		500	10						
92PE37B/2N6706	92PE77B/2N6709	60	2	40		500	2	0.5		500	1.2	50	38/78
92PU05/2N6716	92PU55/2N6728	60	2	20		500	1	0.35		250	1.2	50	39/79
TN2102	TN4036	65	1	40	120	150	10	0.5/0.65		150	1.2	60	12/67
				25		500	10						
TN3019		80	1	100	300	150	10	0.2		150	1.2	100	12
TN3020		80	1	40	120	150	10	0.2		150	1.2	100	12

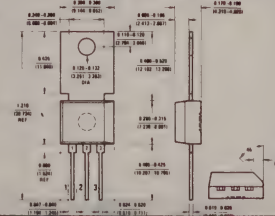
TO-237 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS (Continued)

ELECTRICAL CHARACTERISTICS (Continued)

Part Number		V_{CEO}	I_C	h_{FE}		@		MAX $V_{CE(SAT)}$			P_D	f_T	Process
NPN	PNP	(V)	(A)	Min	Max	I_C(mA)	V_{CE}(V)	(V)	@	I_C(mA)	(W)	(MHz)	(NPN/PNP)
	TN4033	80	1	100	300	100	5	0.15		150	1.2	150	67
92PE37C/2N6707	92PE77C/2N6710	80	2	40		500	2	0.5		500	1.2	50	38/78
92PU06/2N6717	92PU56/2N6729	80	2	20		500	1	0.35		250	1.2	50	39/79
92PU07/2N6718	92PU57/2N6730	100	2	20		500	1	0.35		250	1.2	50	39/79
92PE487/2N6711		160	0.1	30		30	10	1		30	1.2	50	48
92PU391/2N6733		200	0.1	40		10	10	2		20	1.2	50	48
92PE488/2N6712		250	0.1	30		30	10	1		30	1.2	50	48
92PU392/2N6734		250	0.1	40		10	10	2		20	1.2	50	48
92PE489/2N6713		300	0.1	30		30	10	1		30	1.2	50	48
92PU393/2N6735		300	0.1	40		10	10	2		20	1.2	50	48
92PU10/2N6719		300	0.1	40		30	10	0.75		30	1.2	50	48

TO-202 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS

Package Dimensions



Pin	Package 35	Package 36
1	Emitter	Base
2	Base	Collector
3	Collector	Emitter

Mounting Technique

No mounting hardware required. Device normally positioned in socket or soldered perpendicular to board surface.

Package Thermal Characteristics

Max P_d = 10W @ T_c = 25°C
= 1.75W @ T_A = 25°C

O_{JC} = 12.5°C/W

T_J = −65°C to +150°C

ELECTRICAL CHARACTERISTICS

Part Number NPN	Part Number PNP	I_C (A)	V_{CEO} (V)	h_{FE} Min	h_{FE} Max	@ I_C(A)	@ V_{CE}(V)	MAX $V_{CE(SAT)}$ (V)	@ I_C(A)	P_D (W)	f_T (MHz)	Process (NPN/PNP)
NSD457		0.1	160	25		0.03	10	1	0.03	1.75	50	48
NSE457		0.1	160	25		0.03	10	1	0.03	1.75	50	48
NSD458		0.1	250	25		0.03	10	1	0.03	1.75	50	48
NSE458		0.1	250	25		0.03	10	1	0.03	1.75		48
D40N1		0.1	250	30	90	0.02	10			1.67	50	48
D40N2		0.1	250	60	180	0.02	10			1.67	50	48
NSD131		0.1	250	30	90	0.03	10	1	0.02	1.75		48
NSD132		0.1	250	60	180	0.03	10	1	0.02	1.75		48
D40N3		0.1	300	30	90	0.02	10			1.67	50	48
D40N4		0.1	300	60	180	0.02	10			1.67	50	48
NSD133		0.1	300	30	90	0.03	10	1	0.02	1.75	50	48
NSD134		0.1	300	60	180	0.03	10	1	0.02	1.75	50	48
NSD459		0.1	300	25		0.03	10	1	0.03	1.75	50	48
NSE459		0.1	300	25		0.03	10	1	0.03	1.75	50	48
NSDU10		0.1	300	40		0.03	10	1.5	0.02	1.75	60	48
D40N5		0.1	375	20		0.02	10			1.67	50	48
NSD135		0.1	375	30	90	0.03	10	1	0.02	1.75	50	48
D40C1		0.5	30	10k	60k	0.2	5	1.5	0.5	1.33	75	05
D40C2		0.5	30	40k		0.2	5	1.5	0.5	1.33	75	05
D40C3		0.5	30	90k		0.2	5	1.5	0.5	1.33	75	05
D40C4		0.5	40	10k	60k	0.2	5	1.5	0.5	1.33	75	05
D40C5		0.5	40	40k		0.2	5	1.5	0.5	1.33	75	05
D40C7		0.5	50	10k	60k	0.2	5	1.5	0.5	1.33	75	05
D40C8		0.5	50	40k		0.2	5	1.5	0.5	1.33	75	05
D40P1		0.5	120	40		0.08	10	1	0.1	1.67	50	36
D40P3		0.5	180	40		0.08	10	1	0.1	1.67	50	36
D40P5		0.5	225	40		0.08	10	1	0.1	1.67	50	36
D40D1	D41D1	1	30	50	150	0.1	2	0.5	0.5	1.67	200	38/78
D40D2	D41D2	1	30	120	300	0.1	2	0.5	0.5	1.67	200	38/78

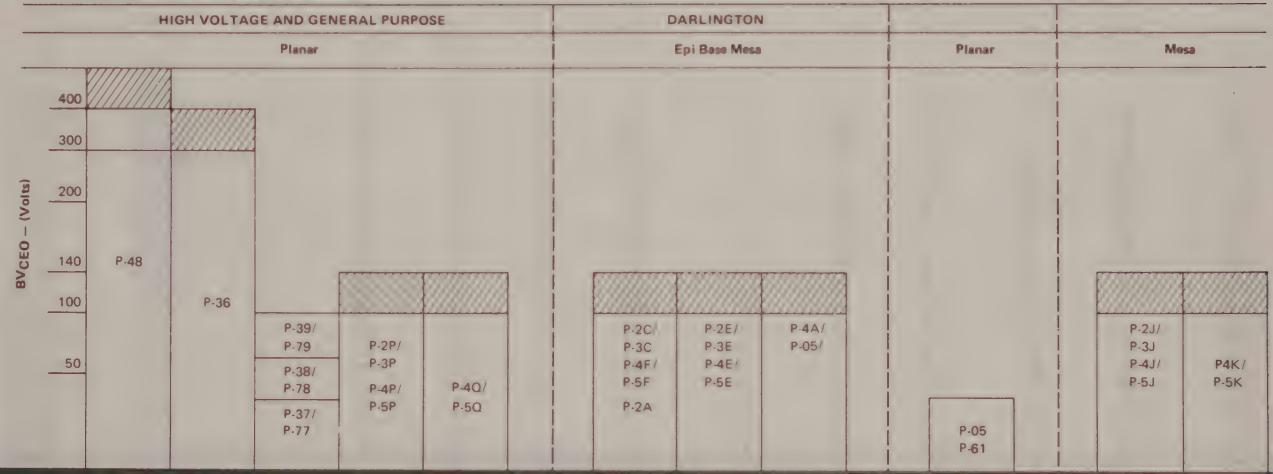
TO-202 TYPE POWER TRANSISTOR ELECTRICAL CHARACTERISTICS AND SPECIFICATIONS (Continued)

ELECTRICAL CHARACTERISTICS (Continued)

Part Number		I_C	V_{CEO}	h_{FE}		@		MAX $V_{CE(SAT)}$	@	P_D	f_T	Process
NPN	PNP	(A)	(V)	Min	Max	I_C(A)	V_{CE}(V)	(V)	I_C(A)	(W)	(MHz)	(NPN/PNP)
D40D3		1	30	290		0.1	2			1.67	200	38
D40D4	D41D4	1	45	50	150	0.1	2	0.5	0.5	1.67	200	38/78
D40D5	D41D5	1	45	120	360	0.1	2	0.5	0.5	1.67	200	38/78
NSD102	NSD202	1	45	50	150	0.1	5	0.2	0.1	1.75	60	37/77
NSD103	NSD203	1	45	120	360	0.1	5	0.2	0.1	1.75	60	37/77
D40D7	D41D7	1	60	50	150	0.1	2	1	0.5	1.67	200	38/78
D40D8	D41D8	1	60	120	360	0.1	2	1	0.5	1.67	200	38/78
2N6551	2N6554	1	60	80	250	0.05	1	0.5	0.25	2.0	75	38/78
D40D10	D41D10	1	75	50	150	0.1	2	1	0.5	1.67	200	38/78
D40D11	D41D11	1	75	120	360	0.1	2	1	0.5	1.67	200	38/78
D40D13	D41D13	1	75	50	150	0.1	2	1	0.5	1.67	200	38/78
D40D14	D41D14	1	75	120	360	0.1	2	1	0.5	1.67	200	38/78
2N6552	2N6555	1	80	80	250	0.05	1	0.5	0.25	2.0	75	39/79
NSD104	NSD204	1	80	50	150	0.1	5	0.2	0.1	1.75	60	39/79
NSD105	NSD205	1	80	120	360	0.1	5	0.2	0.1	1.75	60	39/79
NSD106	NSD206	1	100	50	150	0.1	5	0.2	0.1	1.75	60	39/79
2N6553	2N6556	1	100	80	250	0.05	1	0.5	0.25	2.0	75	39/79
NSD36		1	150	30	300	0.1	10	0.5	0.1	1.75	10	36
NSD36A		1	200	30	300	0.1	10	0.5	0.1	1.75	10	36
NSD36B		1	250	30	300	0.1	10	0.5	0.1	1.75	10	36
NSD36C		1	300	30	300	0.1	10	0.5	0.1	1.75	10	36
NSDU01	NSDU51	2	30	60		0.1	1	0.5	1	1.75	50	37/77
NSD151		2	30	10k	250k	0.1	5	1.5	0.1	1.75	100	05
NSD153		2	30	5k		0.1	5	1.5	0.1	1.75	100	05
D40E1	D41E1	2	30	50		0.1	2	1	1	1.3		38/78
D40K1	D41K1	2	30	10k		0.2	5	1.5	1.5	1.67	75	05/61

2N6549		2	40	25k		0.2	5	1.5	1	1.75	100	05
NSDU45		2	40	25k	150k	0.2	5	1	0.2	1.75	100	05
NSD152		2	40	10k	250k	0.1	5	1.5	1	1.75	100	05
NSD154		2	40	5k		0.1	5	1.5	1	1.75	100	05
D40K2	D41K2	2	50	10k		0.2	5	1.5	1.5	1.67	75	05/61
D40K4	D41K4	2	50	10k		0.2	5	1.5	1.0	1.67	75	05/61
NSDU45A		2	50	25k	150k	0.2	5	1	0.2	1.75	100	05
NSDU05	NSDU55	2	60	80		0.05	1	0.5	0.25	1.75	50	38/78
D40E5	D41E5	2	60	50		0.1	2	1	1	1.3		38/78
NSDU06	NSDU56	2	80	80		0.05	1	0.5	0.25	1.75	50	39/79
D40E7	D41E7	2	80	50		0.1	2	1	1	1.3		38/78
NSDU07	NSDU57	2	100	80		0.05	1	0.5	0.25	1.75	50	39/79
D42C1	D43C1	3	30	25		0.2	1	0.5	1	2.1	50	2P/3P
D42C2	D43C2	3	30	100	220	0.2	1	0.5	1	2.1	50	2P/3P
D42C3	D43C3	3	30	40	120	0.2	1	0.5	1	2.1	50	2P/3P
D42C4	D43C4	3	45	25		0.2	1	0.5	1	2.1	50	2P/3P
D42C5	D43C5	3	45	100	220	0.2	1	0.5	1	2.1	50	2P/3P
D42C6	D43C6	3	45	40	120	0.2	1	0.5	1	2.1	50	2P/3P
D42C7	D43C7	3	60	25		0.2	1	0.5	1	2.1	50	2P/3P
D42C8	D43C8	3	60	100	220	0.2	1	0.5	1	2.1	50	2P/3P
D42C9	D43C9	3	60	40	120	0.2	1	0.5	1	2.1	50	2P/3P
D42C10	D43C10	3	80	25		0.2	1	0.5	1	2.1	50	2P/3P
D42C11	D43C11	3	80	100	220	0.2	1	0.5	1	2.1	50	2P/3P
D42C12	D43C12	3	80	40	120	0.2	1	0.5	1	2.1	50	2P/3P

POWER SELECTION GUIDE



	Planar					Epi Base Mesa			Planar	Mesa	
TO-92	0.6 W		0.6 W						0.6		
TO-237											
TO-202	12.5	15	10	15					10		
TO-126		20	15	30		30	40			40	
TO-220				40	60	40	50	60		50	60

Device	Input Offset Voltage Max (mV)	Input Offset Voltage Drift Typ (μV/°C)	Input Offset Current Max (nA)	Input Bias Current Max (nA)	Voltage Gain Min (Volts/V)	Bandwidth A_V = 1 Typ (MHz)	Slew Rate A_V = 1 Typ (V/μs)	Output Current (mA)	Supply Voltage Min (V)	Supply Voltage Max (V)	Common Mode Range (V)	Differential Input Voltage (V)	Supply Current Max (mA)	Compensation Components	Package Types
INDUSTRIAL TEMPERATURE RANGE: -25°C to +85°C															
LH0001AC	5	3	60	200	25,000	1	0.25	±5	±5	±20	$\pm V_S$	±7	1.3	2	TO-5 DIP
LH0002C	30	(Note 2)	10×10^3	10^4	0.95[2]	50	100	±100	±5	±22	$\pm V_S$	(Note 2)	100	0	TO-5 DIP
LH0003C	3	4	200	2,000	15,000	30[1]	30[1]	±50	±5	±20	$\pm V_S$	±7	30	2	TO-5
LH0004C	1.5	4	45	120	30,000	1	0.25	±15	±5	±45	$\pm V_S$	±7	1.5	2	TO-5
LH0005C	10	25	25	100	2,000	30[1]	20[1]	±50	±9	±20	$\pm V_S$	±15	90	3	TO-5
LH0020C	6	10	200	500	50,000	1	0.25	±100	±5	±18	$\pm V_S$	±30	50	2	TO-8
LH0021C	6	5	200	500	100,000	1	3	±1,000	±5	±18	$\pm V_S$	±30	40	0	TO-3
LH0022C	6	5	0.005	0.025	75,000	1	3	±10	±5	±22	$\pm V_S$	±30	24	0	TO-5 DIP
LH0024C	8	25	5×10^3	22×10^3	3,500	50	400	±100	±9	±18	$\pm V_S$	±5	252	1	TO-5
LH0032C	15	25	.02	0.5	700	50	500	±100	±5	±20	$\pm V_S$	±30	220	2	TO-8
LH0033C	20	(Note 3)	(Note 3)	0.15	0.96[3]	100	1,500	±100	±5	±20	$\pm V_S$	(Note 3)	240	0	TO-8 8 PIN J
LH0041C	6	5	200	500	100,000	1	3	±200	±5	±18	$\pm V_S$	±30	40	0	TO-8 8 PIN J
LH0042C	20	10	0.01	0.05	25,000	1	3	±10	±5	±22	$\pm V_S$	±30	28	0	TO-5 DIP
LH0044AC	0.025	0.5	2.5	15	1,000,000	0.4	0.06	±1.3	±3	±20	$\pm V_S$	±15	3	0	TO-5
LH0044B	0.050	0.5	5	30	500,000	0.4	0.06	±1.3	±3	±20	$\pm V_S$	±15	4	0	TO-5
LH0044C	0.150	1.3	5	30	500,000	0.4	0.06	±1.3	±3	±20	$\pm V_S$	±15	4	0	TO-5
LH0052C	1	5	0.0002	0.005	75,000	1	3	±10	±5	±22	$\pm V_S$	±30	30	0	TO-5 DIP
LH0061C	10	5	200	200	25,000	15	70	±500	±5	±18	$\pm V_S$	(Note 4)	150	1	TO-3
LH0062C	15	10	0.002	0.065	25,000	15	70	±6	±5	±20	$\pm V_S$	±30	120	0	TO-5 DIP
LH0063C	50	(Note 3	(Note 3)	0.2	0.96[3]	150	6,000	±400	±5	±18	$\pm V_S$	(Note 3)	500	0	TO-3

INDUSTRIAL & COMMERCIAL HYBRID OP AMP SELECTION GUIDE (Continued)

Device	Input Offset Voltage Max (mV)	Input Offset Voltage Drift Typ (μV/°C)	Input Offset Current Max (nA)	Input Bias Current Max (nA)	Voltage Gain Min (Volts/V)	Bandwidth A_V = 1 Typ (MHz)	Slew Rate A_V = 1 Typ (V/μs)	Output Current (mA)	Supply Voltage Min (V)	Supply Voltage Max (V)	Common Mode Range (V)	Differential Input Voltage (V)	Supply Current Max (mA)	Compensation Components	Package Types
LH2201A	2	15	10	75	25,000	1	0.5	5	±3	±22	±12	±30	3	1	DIP F, P
LH2208	2	15	0.2	2	50,000	1	0.3	1	±2	±20	±14	(Note 4)	0.4	1	DIP F, P
LH2208A	0.5	5	0.2	2	80,000	1	0.3	1	±2	±20	±14	(Note 4)	0.4	1	DIP F, P
LH2210	4			3	0.999	20	30	1	±5	±18	±10		5.5	0	DIP F, P
COMMERCIAL TEMPERATURE RANGE: 0°C to +70°C															
LH2301A	7.5	30	50	250	25,000	1	0.5	5	±3	±18	±12	±30	3	1	DIP F, P
LH2308	7.5	30	1	7	25,000	1	0.3	1	±2	±18	±14	(Note 4)	0.8	1	DIP F, P
LH2308A	0.5	5	1	7	80,000	1	0.3	1	±2	±20	±14	(Note 4)	0.8	1	DIP F, P
LH2310	7.5	*		7	0.999	20	30	1	±5	±18	±10	*	5.5	0	DIP F, P
LH24250C	6	*	10	30	75,000	0.25	0.16	0.75	±1	±18	±12	±15	0.03 set	0	DIP F, P

*Not specified. **Note 1:** Specified for A_V = –10. **Note 2:** Current Booster. **Note 3:** Voltage follower. **Note 4:** Inputs have shunt-diode protection; current must be limited.

MILITARY HYBRID OP AMP SELECTION GUIDE

Device	Input Offset Voltage Max (mV)	Input Offset Voltage Drift Typ (μV/°C)	Input Offset Current Max (nA)	Input Bias Current Max (nA)	Voltage Gain Min (Volts/V)	Bandwidth A_V = 1 Typ (MHz)	Slew Rate A_V = 1 Typ (V/μs)	Output Current (mA)	Supply Voltage Min (V)	Supply Voltage Max (V)	Common Mode Range (V)	Differential Input Voltage (V)	Supply Current Max (mA)	Package Types
MILITARY TEMPERATURE RANGE: –55°C to +125°C														

LH0002	30	(Note 2)	10×10^{-6}	10^{-4}	.95	50	100	±100	±5	±22	$\pm V_S$	(Note 2)	20	TO-5, DIP
LH0003	3	4	200	2,000	15	30(1)	30(1)	±50	±5	±20	$\pm V_S$	±7	3	TO-5
LH0004	1	4	20	100	30	1	.25	±15	±5	±45	$\pm V_S$	±7	0.35	TO-5
LH0005	10	20	20	50	2	30(1)	20(1)	±50	±9	±20	$\pm V_S$	±15	9	TO-5
LH0020	2.5	10	50	250	100,000	1	.25	±40	±5	±22	$\pm V_S$	±30	5	TO-8
LH0021	3	3	100	300	100,000	1	3	±1000	±5	±18	$\pm V_S$	±30	3.5	TO-3
LH0022	4	5	.002	.01	100,000	1	3	±10	±5	±22	$\pm V_S$	±30	2.5	TO-5, DIP
LH0024	4	20	3×10^{-3}	20×10^{-3}	4,000	50	400	±100	±9	±18	$\pm V_S$	±5	13.5	TO-5
LH0032	5	25	.01	.02	1,000	50	500	±100	±5	±18	$\pm V_S$	±30	20	TO-8
LH0033	10	(Note 3)	(Note 3)	0.1	.97(3)	100	1,500	±100	±5	±20	$\pm V_S$	(Note 3)	22	TO-8, DIP
LH0041	3	3	100	300	100,000	1	3	±200	±5	±18	$\pm V_S$	±30	3.5	TO-8, DIP
LH0042	20	5	.005	.025	50,000	1	3	±10	±5	±22	$\pm V_S$	±30	3.5	TO-5, DIP
LH0044	0.050	0.2	10	100	800,000	0.4	0.06	1	±2	±20	$\pm V_S$	±15	4	TO-5
LH0044A	0.075	0.1	5	50	1,000,000	0.4	0.06	1	±2	±20	$\pm V_S$	±15	3	TO-5
LH0052	0.5	2	.0001	.001	100,000	1	3	±10	±5	±22	$\pm V_S$	±30	3.5	TO-5, DIP
LH0061	4	5	100	300	50,000	15	70	±500	±5	±18	$\pm V_S$	(Note 4)	10	TO-3
LH0062	5	5	.001	.025	50,000	15	70	±6	±5	±20	$\pm V_S$	±30	8	TO-5, DIP
LH0063	25	(Note 1)	(Note 3	0.2	.96(3)	150	6,000	±400	±5	±18	$\pm V_S$	(Note 3)	75	TO-3
LH2101A	2	15	10	75	50,000	1	0.5	5	±3	±22	±12	±20	2.5	DIP, F.P.
LH2108	2	15	0.2	2	50,000	1	0.3	1	±2	±20	±14	(Note 4)	0.4	DIP, F.P.
LH2108A	0.5	5	0.2	2	80,000	1	0.3	1	±2	±20	±14	(Note 4)	0.4	DIP, F.P.
LH24250	3.0	(Note 5)	5	15	100,000	(Note 5)	(Note 5)	1	±1	±18	±15	±15	0.01	DIP, F.P.

Notes: 1) Specified for $A_V = -10$. (2) Current booster. (3) Voltage Follower. (4) Inputs have shunt-diode protection; current must be limited to ±10 mA. (5) A function of external set resistors.

BUFFER AMPLIFIERS

Features	Voltage Gain (Min)	Output Current	Slew Rate	Input Impedance	-55°C to +125°C	-25°C to +85°C
Bipolar Input, medium speed	0.95	±100 mA	200 V/μs	180 kΩ	LH0002H	LH0002CH LH0002CN
FET Input, high speed	0.97	±100 mA	1000 V/μs	10^{10} Ω	LH0033G	LH0033CG LH0022CJ
FET Input, very high speed	0.95	±250 mA	2000 V/μs	10^{10} Ω	LH0063K	LH0063CK

NON-LINEAR FUNCTIONS

Function	Characteristics	Transfer Characteristics	Part Number -55°C to +125°C	Part Number -25°C to +85°C
True RMS to DC Converter	0.05% accuracy, 100 kHz bandwidth, crest factor 5 minimum	$E_{OUT} = \sqrt{\frac{1}{T}\int_o^T E_{IN}^2(t)dt}$	LH0091D	LH0091CD
Multifunction Converter	0.05% accuracy, device multiplies, divides, square roots, raises to fractional powers	$E_{OUT} = V_Y\left(\frac{V_Z}{V_X}\right)^m$	LH0094D	LH0094CD

INSTRUMENTATION AMPLIFIERS

Features	Characteristics						Part Number	
	I_B Max	V_{OSin} Max	$\frac{\Delta V_{OS}}{\Delta T}$	Gain Lin.	Gain Tempco	Gain Error	-25°C to +85°C	-55°C to +125°C
90 μW dissipation, wide supply range, one external gain set resistor	125 nA 100 nA	2 mV 1 mV	10 μV/°C 10 μV/°C	0.03% 0.03%	•	3% max 1% max	LH0036C	LH0036
Low cost, one external gain set resistor	500 nA	2 mV 1 mV	10 μV/°C 10 μV/°C	0.03% 0.03%	• •	1% 0.3%	LH0037C	LH0037
Ultra low drift, all gain set resistors internal, very low noise, very linear, guard drive amplifier included.	100 nA	150 μV 100 μV	1 μV/°C max 0.25 μV/°C max	1 ppm 1 ppm	7 ppm/°C 7 ppm/°C	0.1% 0.1%	LH0038C	LH0038
Monolithic, external gain set resistors (2).	40 pA 20 pA	30 mV 15 mV	10 μV/°C 10 μV/°C	0.1% max 0.05% max		0.2% max 0.1% max	LF252	LF152

Function	Features	Line Reg	Load Reg	I_{OUT} (mA)	@25°C (Max)	Drift (Max)	-55°C to +125°C	-25°C to +85°C
Positive Programmable Voltage Regulator	Internal programming resistors, adjustable current limit. V_{OUT} = 5, 6, 8, 10, 12, 15, 18V	0.008%	0.055%	0.1-200			LH0075	LH0075C
Negative Programmable Voltage Regulator							LH0076	LH0075C
10,000V Precision BCD Reference	Three-terminal buffered zener reference, 0.1Ω output, 11.5 to 40V Input, 100 μVp-p noise	0.02% 0.02% 0.02%	0.01% 0.02% 0.02%	0-5	0.1% 0.1% 0.05%	20 mV* 10 mV 4 mV	LH0070-0 LH0070-1 LH0070-2	
10.024V Precision Binary Reference					0.1% 0.1% 0.05%	20 mV* 10 mV 4 mV	LH0071-0 LH0070-1 LH0070-2	
6.95V Temperature Stabilized Reference	Thermostated two-terminal zener, 0.5Ω low noise		0.1%	0.5-10	+1% -2%	15 mV 1 mV	LM199	LM299

*These specifications apply for -25°C to +85°C. **Note:** Refer to the *Linear Databook* for information on other regulators and references.

SAMPLE AND HOLD AMPLIFIERS

Each of these circuits includes input and output buffer amplifiers and analog switches for a complete sample and hold function.

Features	Accuracy (Max)	Drift Rate (T_j = 25°C)	Acquisition Time	Aperture Time	Part Number -55°C to +125°C	Part Number -25°C to +85°C
Monolithic	±.02%	30 mV/s (Note 1)	20 μs (Note 2)	25 ns	LF198	LF298
Precision	±0.01% ±0.02%	10 mV/s (Note 2)	50 μs (Note 2)	150 ns	LH0023G	LH0023CG

Features	Accuracy (Max)	Drift Rate (T_j = 25°C)	Acquisition Time	Aperture Time	Part Number -55°C to +125°C	Part Number -25°C to +85°C
Medium Speed	±0.1% ±0.3%	10 mV/s (Note 1)	10 μs (Note 1)	20 ns	LH0043G	LH0043CG
High Speed	±0.2% ±0.3%	30 mV/s (Note 1)	5 μs (Note 1)	25 ns	LH0053G	LH0053G

Note 1: C_S = 1,000 pF. **Note 2:** C_S = 10,000 pF.

MOS CLOCK DRIVERS

Features	Characteristics					Part Number	
	V_{OUT} (Max)	I_{OUT} (Max)	PRF	t_{ON}	t_{OFF}	-55°C to +125°C	-25°C to +85°C
Single Phase, DC Coupled	30V	0.3A	≤5 MHz	50 ns	75 ns	MH0007	MH0007
Two Phase, DC Coupled	30V	0.5A	≤2 MHz	35 ns	60 ns	MH0009	MH0009C
Single Phase, DC Coupled	30V	1.0A	≤10 MHz	15 ns	50 ns	MH0012	MH0012C
Two Phase, AC Coupled	30V	0.5A	≤2 MHz	35 ns	60 ns	MH0013	MH0013C
Two Phase, AC Coupled	30V	0.5A	≤1 MHz	30 ns	60 ns	DS0025	DS0025C
Two Phase, AC Coupled	20V	1.5A	≤5 MHz	12 ns	15 ns	DS0026	DS0026C

Note: Refer to Application Note AN-76 for additional information on clock drivers. For additional interface product information refer to the *Interface Databook*.

DIGITAL DRIVERS

These devices accept TTL or DTL input and provide extended output capability for actuators and displays.

Typical Application Function	Characteristics					Part Number	
	I_{OUT}	V_{SAT}	LV_{CEO}	t_{ON}	t_{OFF}	-55°C to +125°C	-25°C to +85°C
Lamp Driver, Current Sinking	0.4A	1.0V	45V	0.26 µs	2.2 µs	DH0011H	DH0011CH DH0011CN
Motor, Relay, Current Sourcing	1.6A	1.5V	45V	0.40 µs	7.0 µs	DH0006H	DH0006CH DH0006CN
Lamps, Relay, Current Sourcing	0.25A	0.4V	40V	0.16 µs	0.22 µs	DH0008H	DH0008CH DH0008CN
Relay, Display, Current Sinking	0.25A	0.6V	70V	50 ns	500 ns		DH0016CN
Display, Current Sinking	0.50A	0.6V	50V	50 ns	1.5 µs		DH0017CN
Display, Current Sinking	0.05A	0.6V	100V	50 ns	1.5 µs		DH0018CN
Hammer Driver	5.0A	2.0V	45V	0.4 µs	7.0 µs	DH0028H	DH0028CH DH0028CN
Level Translator	100 mA	0.5V	-25V	25 ns	75 ns	DH0034D DH0034H	DH0034CD DH0034CH

DIGITAL-TO-ANALOG CONVERTERS

Resolution	Linearity Error	Output Voltage Ranges	Internal Reference	Input Logic Format	Settling Time	Part Number
12 bits	±0.0122%	+10.24V, +10.24V	10.240V	Comp. Binary	5.0 µs	DAC1200
12 bits	+0.0488%	+10.24V, +10.24V	10.240V	Comp. Binary	5.0 µs	DAC1201
3 digits	+0.01%	+10V, +10V	10.000V	Comp. BCD	5.0 µs	DAC1202
3 digits	+0.05%	+10V, +10V	10.000V	Comp. BCD	5.0 µs	DAC1203
12 bits	+0.0122%	±10V, ±5V, ±2.5V, +5V	6.3V	Comp. Binary	5.0 µs	DAC1280
12 bits	+0.0122%	+10V, +5V, +2.5V, +5V	6.3V	Comp. Binary	5.0 µs	DAC1285
3 digits	+0.05%	+10V	6.3V	Comp. BCD	5.0 µs	DAC1286
3 digits	±0.1%	+10V	6.3V	Comp. BCD	5.0 µs	DAC1287

Note: For additional information on monolithic converters see the *Data Acquisition Handbook*.

Function	Features	Frequency Accuracy	Q Accuracy	Q x F_C	Part Number -55°C +125°C	Part Number -25°C to +85°C
Universal Active Filter	State Variable Building Block	±2.5%	±7.5%	50K	AF100-1	AF100-1C
		±1.0%	±7.5%	50K	AF100-2	AF100-2C
Universal Active Filter	State Variable Building Block Wide Bandwidth	±2.5%	±7.5%	200K		AF150-1C
		±1.0%	±7.5%	200K		AF150-2C
Dual Universal Active Filter	State Variable Building Block Two AF100 in one package	±2.5%	±7.5%	50K		AF151-1C
		±1.0%	±7.5%	50K		AF151-2C
		Resistor Accuracy	**Resistor Match**	**Resistor Tempco**		
General Impedance Converter (GIC)	Matched Resistors 7.5K and Controlled TC	1%	±0.2%/ 0.1%	±110 ±30 ppm/°C	AF120H	
		2%	±0.4%/ 0.2%	±110 ±60 ppm/°C		AF120CH

ACTIVE FILTERS (TUNED)

Function	Features	Cutoff/ Band Edge Freq. (Hz)	Passband Ripple (dB)	Stopband Frequency (Hz)	Stopband Attenuation (dB)	Gain Tolerance (dB)	Part Number
Touch Tone* Filters for Dual Tone Multifrequency Receivers (DTMF)	High Band Splitter Filter	1209	±0.5	941	25	±0.5 @ 1336 Hz	AF101CJ
	Dial Tone Reject Filter	697	±0.5	440	34	±0.5 @ 941 Hz	AF102CJ
	Low Band Splitter Filter	941	±0.5	1209	25	±0.5 @ 852 Hz	AF103CJ
	697 Hz/770 Hz Dual Bandpass Filter	697±0.5% 770±0.5%		Q = 15±0.5 Q = 15±0.5		±0.25 @ 697 Hz ±0.25 @ 770 Hz	AF111CJ

ACTIVE FILTERS (TUNED) (Continued)

Function	Features	Cutoff/ Band Edge Freq. (Hz)	Passband Ripple (dB)	Stopband Frequency (Hz)	Stopband Attenuation (dB)	Gain Tolerance (dB)	Part Number
Touch Tone* Filters for Dual Tone Multifrequency Receivers (DTMF)	852 Hz/941 Hz Dual Bandpass Filter	852±0.5% 941±0.5%		Q = 15±0.5 Q = 15±0.5		±0.25 @ 852 Hz ±0.25 @ 941 Hz	AF112CM
	1209 Hz/1336 Hz Dual Bandpass Filter	120+0.5% 1336±0.5%		Q = 15±0.5 Q = 15±0.5		±0.25 @ 1209 Hz ±0.25 @ 1336 Hz	AF113CJ
	1477 Hz/1633 Hz Dual Bandpass Filter	1477±0.5% 1633±0.5%		Q = 15±0.5 Q = 15±0.5		±0.25 @ 1477 Hz ±0.25 @ 1633 Hz	AF114CJ
	DTMF Low Band Splitter 6th Order Bandpass Filter	690/950 690/950	5 p-p 2 p-p	500/1200 500/1200	-38 -40	±1.5 @ 800 Hz ±0.5 @ 820 Hz	AF121-CJ AF121-2CJ
	DTMF High Band Splitter 6th Order Bandpass Filter	1200/1650 1200/1650	4 p-p 2 p-p	950/2200 950/2200	-38 -40	±0.5 @ 1400 Hz ±0.5 @ 1480 Hz	AF122-1CJ AF122-2CJ
Addition Tone Receiver Circuits	Automatic Gain Control (AGC) Threshold Detector (Dual)						AF104 AF105 AF110
Pulse Code Modulation (PCM) Filters 8 kHz Sampling Rate	Transmit/Receive PCM Filter for 8 kHz Sampling (sin x)/x Correction	3000 3000	±0.5 ±0.5	5300 4900	-20 -20	±0.5 ±0.5	AF132CJ
	5th Order Low Pass Filter Transmit PCM Filter	3000 3000	±0.3 ±0.125	4600 4600	-30 -32	External Resistor	AF133-1CJ AF133-2CJ
	5th Order Low Pass Filter Receive PCM Filter	3000 3000	±0.3 ±0.125	4600 4600	-30 -32	±1.0 @ 1 kHz ±0.5 @ 1 kHz	AF134-1CJ AF134-2CJ
		Bandwidth			**Center Frequency**		
Tunable Bandpass Filter/Oscillator	Single Resistor Tuning	2.5 Hz or 5 Hz			60 Hz to 270 Hz		AF99CJ

*Registered Trademark of Western Electric Co.

R_{ON} (Ω)	V_A/I (V)	Part Number	Logic Input	V_S (V) Typ	t_{ON}/t_{OFF} Typ
Single SPST					
2-30	±10	AM1000H	*		100/100 ns
20-50	±15	AM1001H	*		150/100 ns
20-100	±10	AM1002H	*		200/100 ns
*Requires driver.					
Dual SPST					
*10	±10	AH0141/DG141	TTL	−18, 12	0.8/1.1 µs
30	±10	AH0133/DG133	TTL	−18, 12	0.5/0.9 µs
80	±10	AH0134/DG134	TTL	−18, 12	0.5/0.9 µs
15	±7.5	AH0151/DG151	TTL	±15	0.8/1.1 µs
50	±7.5	AH0152/DG152	TTL	±15	0.5/0.9 µs
Quad SPST					
200/600	±10	AH0015	TTL	−20, 10, 5	100/400 ns
*200	±10	LF11201	TTL	±15	90/500 ns
*200	±10	LF11202	TTL	±15	90/500 ns
*200	±10	LF11331	TTL	±15	90/500 ns
*200	±10	LF11332	TTL	±15	90/500 ns
*200	±10	LF11333	TTL	±15	90/500 ns
*250	±10	LF13201	TTL	±15	90/500 ns
*250	±10	LF13202	TTL	±15	90/500 ns
*250	±10	LF13331	TTL	±15	90/500 ns
*250	±10	LF13332	TTL	±15	90/500 ns
*250	±10	LF13333	TTL	±15	90/500 ns
280	±7.5	CD4066	CMOS	±7.5	
850	±7.5	CD4016	CMOS	±7.5	
*30	±7.5	AM193	TTL	±15, 5	180/150 ns
*75	±10	AM194	TTL	±15, 5	300/150 ns

R_{ON} (Ω)	V_A/I (V)	Part Number	Logic Input	V_S (V) Typ	t_{ON}/t_{OFF} Typ
SPDT					
10	±10	AH0146/DG146	TTL	−18, 12	0.8/1.1 µs
30	±10	AH0144/DG144	TTL	−18, 12	0.5/0.9 µs
80	±10	AH0143/DG143	TTL	−18, 12	0.5/0.9 µs
15	±7.5	AH0161/DG161	TTL	±15	0.8/1.1 µs
SPST					
50	±7.5	AH0162/DG162	TTL	±15	0.5/0.9 µs
100	±9	AH2114 (Sw. 1)	15V TTL	±15	35/600 ns
		(Sw. 2)			1.2 µs/50 ns
Triple SPDT					
280	±7.5	CD4053	CMOS	±7.5	150/150 ns
Dual DPST					
10	±10	AH0140/DG140	TTL	−18, 12	0.8/1.1 µs
30	±10	AH0129/DG129	TTL	−18, 12	0.5/0.9 µs
80	±10	AH0126/DG126	TTL	−18, 12	0.5/0.9 µs
15	±7.5	AH0153/DG153	TTL	±15	0.8/1.1 µs
50	±7.5	AH0154/DG154	TTL	±15	0.5/0.9 µs
200/600	±10	AH0019	TTL	−20, 10, 5	100/400 ns
Dual DPDT					
10	±10	AH0145/DG145	TTL	−18, 12	0.8/1.1 µs
30	±10	AH0139/DG139	TTL	−18, 12	0.5/0.9 µs
80	±10	AH0142/DG142	TTL	−18, 12	0.5/0.9 µs
15	±7.5	AH0163/DG163	TTL	±15	0.8/1.1 µs
50	±7.5	AH0164/DG164	TTL	±15	0.5/0.9 µs
200/600	±10	AH0014	TTL	−20, 10, 5	350/400 ns

ANALOG SWITCHES & MULTIPLEXERS (Continued)

R_{ON} (Ω)	V_A/I (V)	Part Number	Logic Input	V_S (V) Typ	t_{ON}/t_{OFF} Typ
MULTIPLEXERS					
4-Channel Differential					
280	±7.5	CD4052	CMOS	±7.5	150/150 ns
*350	12, −15	LF11509	TTL	±15	1/0.2 μs
270	±7.5	CD4529B	CMOS	±7.5	50/50 ns
6-Channel					
250-1500	50 mA	AM2009/MM4504	TTL	15.5	
8-Channel					
250-400	±5	AM3705	TTL	15,5	300/600 ns
*350	12, −15	LF11508	TTL	±15	1/0.2 μs
270	±7.5	CD45298	CMOS	±7.5	50/50 ns
280	±7.5	CD4051	CMOS	±7.5	150/150 ns

Notes:

R_{ON} max @ T_A = 25°C

V_A/I = maximum voltage or current to be safely switched

Part number = basic number/alternate number (i.e., AM181/DG181). May be ordered by either number.

*Preferred devices

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
AD7520 10-Bit Binary Mult. D/A Converter			•			•			•		
AD7521 12-Bit Binary Mult. D/A Converter			•			•			•		
AD7530 10-Bit Mult. D/A Converter			•			•			•		
AD7531 12-Bit Binary Mult. D/A Converter			•			•			•		
AD7533 10-Bit Binary Mult. D/A Converter			•			•			•		
AD7541 12-Bit Binary Mult. D/A Converter										•	
ADB1200 12-Bit A/D Building Block (MM5863)						•			•		
ADB4500 4-1/2 Digit Building Block (MM5330)											•
ADC0800 8-Bit A/D Converter (MM5357)			•			•			•		
ADC0801/0802/0803/0804 8-Bit Differential Input A/D Converter μP			•			•			•		
ADC0808/0809 8-Bit A/D Converter			•			•			•		
ADC0816/0817 8-Bit A/D Converter			•			•			•		
ADC1210 12-Bit A/D Converter			•						•		
ADC1211 10-Bit A/D Converter			•						•		
ADC3511 A/D Converter										•	
ADC3711 A/D Converter										•	
DAC0800 8-Bit D/A Converter			•	•		•			•		
DAC0801 8-Bit D/A Converter				•		•			•		
DAC0802 8-Bit D/A Converter										•	
DAC0806/0807 8-Bit D/A Converter				•		•			•		

LINEAR PRODUCT STATUS GUIDE (Continued)

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
DAC0808 8-Bit D/A Converter			•	•		•			•		
DAC1000 10-Bit μP D/A Converter			•						•		
DAC1020/1021/1022 10-Bit D/A Converter				•					•		
DAC1200/1201 12-Bit D/A Converter			•						•		
DAC1201/1203 3-Digit D/A Converter			•						•		
DAC1220/1221/1222 12-Bit D/A Converter			•						•		
DAC1280 12-Bit D/A Converter			•						•		
DAC1285 12-Bit D/A Converter			•						•		
DAC1286/1287 3-Digit D/A Converter			•						•		
LF111/LF211/LF311 Voltage Comparator	•	•							•		
LF147/LF347 JFET Quad BI-FET						•			•		
LF151/LF351 Single Low Cost BI-FET Op Amp	•					•			•		
LF152/LF352 Input Instru. Op Amp			•						•		
LF153/353 Dual BI-FET	•			•			•		•		
LF155/LF255/LF355 JFET Input Op Amp	•						•		•		
LF155A/LF355A JFET Input Op Amp	•						•		•		
LF156/LF256/LF356 JFET Input Op Amp	•						•		•		
LF156A/LF356A JFET Input Op Amp	•								•		
LF157/LF257/LF357 JFET Input Op Amp	•										
LF157A/LF357A JFET Input Op Amp	•						•		•		

LF3700 CODEC			•						•		
LF11005 Low Power BI-FET Quad Op Amp										•	
LF11011 Low Noise BI-FET Op Amp										•	
LF11201/LF13201 Quad FET Analog Switch			•			•			•		
LF11202/LF13202 Quad FET Analog Switch			•			•			•		
LF11331/LF13331 Quad FET Analog Switch			•			•			•		
LF11332/LF13332 Quad FET Analog Switch			•			•			•		
LF11333/LF13333 Quad FET Analog Switch			•			•			•		
LF11508/LF13508 BI-FET 8-Channel MUX			•						•		
LF11509/LF13509 BI-FET 4-Channel MUX			•						•		
LF13300 Dual Slope A/D Converter			•						•		
LF13741 JFET Op Amp	•						•		•		
LFT155/LFT355 Low Offset Monolithic JFET Op Amp	•										
LFT156/LFT356 Low Offset Monolithic JFET Op Amp	•										
LH101/LH201 Compensated Op Amp											•
LM10/LM10B/LM10C/LM10BL/LM10CL Low Voltage Op Amp	•								•		
LM100/LM200/LM300 Positive Voltage Regulator											•
LM101/LM201 Op Amp	•	•		•	•				•		
LM101A/LM201A/LM301A Improved Op Amp	•	•	•	•	•		•		•		
LM102/LM202/LM302 Voltage Follower Op Amp	•								•		
LM103 Voltage Reference	•								•		
LM104/LM204/LM304 Negative Voltage Regulator	•								•		
LM105/LM205/LM305 Positive Voltage Regulator	•								•		
LM106/LM206/LM306 Voltage Comparator	•	•							•		

LINEAR PRODUCT STATUS GUIDE (Continued)

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
LM107/LM207/LM307 Compensated Op Amp	•	•		•	•	•	•		•		
LM108/LM208/LM308 Super Gain Op Amp	•	•		•		•	•		•		
LM108A/LM208A/LM308A Operational Amplifier	•	•		•		•	•		•		
LM109/LM209/LM309 5V Regulator	•							K, K-Steel	•		
LM110/LM210/LM310 Voltage Follower Op Amp	•	•		•	•		•		•		
LM111/LM211/LM311 Voltage Comparator	•	•		•		•	•		•		
LM112/LM212/LM312 Compensated Super Gain Op Amp	•	•				•			•		
LM113/LM313 Diode Reference	•								•		
LM114/LM114A/LM115/LM115A Matched Dual Transistor											•
LM117/LM217/LM317 3-Terminal Adjustable Regulator	•							K-Steel, T, P	•		
LM117HV/LM217HV/LM317HV High Volt. 3-Terminal Volt. Regulator								K Steel	•		
LM118/LM218/LM318 High Slew Rate Op Amp	•		•	•			•		•		
LM119/LM219/LM319 Dual Voltage Comparator	•		•	•			•		•		
LM120/LM320 Neg. Fixed Voltage Regulator	•							K, T	•		
LM121/LM221/LM321 Precision Preamp	•	•	•						•		
LM121A/LM221A/LM321A Precision Preamp	•	•	•						•		
LM122/LM222/LM322 Timer	•	•				•			•		
LM123/LM223/LM323 3-Amp LM109								K	•		
LM124/LM224/LM324 Quad Op Amp				•		•			•		

LM125/LM325 Dual Track Voltage Regulator	•					•			•		
LM126/LM326 Dual Track Voltage Regulator	•					•			•		
LM127/LM227/LM327 Dual Track Voltage Regulator											•
LM129/LM329 Temperature Comp. Voltage Reference	•							Z	•		
LM130/LM330 Low Dropout Voltage Regulator								P	•		
LM131/LM231/LM331 Precision Voltage to Frequency Converter	•						•		•		
LM134/LM234/LM334 Constant Current Source	•							Z	•		
LM135/LM235/LM335 Temperature Sensor	•							Z	•		
LM136/LM236/LM336 Constant Voltage Source	•							Z	•		
LM136-5/LM236-5/LM336-5 Constant Voltage Source	•							Z	•		
LM137/LM237/LM337 Negative 3 Term V.R. Adjustable	•							P, K-Steel	•		
LM138/LM238/LM338 5 Amp 3 Terminal Adj. Regulator								K Steel	•		
LM139/LM239/LM339 Quad Comparator				•		•			•		
LM139A/LM239A/LM339A Quad Comparator				•		•			•		
LM140/LM340 Positive Fixed Voltage Regulator (1A)								K, T, KC	•		
LM140L/LM340L Positive Fixed Voltage Regulator (0.1A)	•							Z	•		
LM143/LM343 High Voltage Op Amp	•								•		
LM144/LM344 High Voltage Op Amp	•								•		
LM145/LM345 Negative 3-Amp Regulator								K	•		
LM146/LM346 Quad Micropower Op Amp				•						•	
LM148/LM248/LM348 Quad LM741				•		•			•		
LM149/LM249/LM349 Decomp. Quad Op Amp				•		•			•		
LM150/LM250/LM350 3-Amp Adjustable Regulator								K-Steel	•		
LM158/LM258/LM358 Dual Op Amp	•						•		•		
LM158A/LM258A/LM358A Dual Op Amp	•						•		•		

LINEAR PRODUCT STATUS GUIDE (Continued)

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
LM159 Dual High Speed Programmable Current Mode Op Amp											
LM160/LM260/LM360 High Speed Voltage Comparator	•	•		•		•			•		
LM161/LM261/LM361 High Speed Voltage Comparator	•	•		•		•			•		
LM185/LM285/LM385 Micropower Reference	•							Z		•	
LM192/LM292/LM392 Op Amp and Comparator	•				•		•		•		
LM193/LM293/LM393 Dual Comparator	•						•		•		
LM193A/LM293A/LM393A Dual Comparator	•						•		•		
LM194/LM294 Supermatch Pair	•								•		
LM195/LM295/LM395 Power Transistor	•								•		
LM199/LM299/LM399 Temp. Comparator Voltage Reference	•							K	•		
LM199A/LM299A/LM399A Temp. Comparator Voltage Reference	•								•		
LM216/LM216A/LM316/LM316A Precision Op Amp	•								•		
LM320L Switching Regulator				•					•		
LM320M Negative Fixed Voltage Regulator								Z	•		
LM320ML Switching Regulator								P	•		
LM341 Series Positive Regulator (0.5A)								P	•		
LM342 Series Positive Regulator (0.25A)								P	•		
LM376 Positive Voltage Regulator							•		•		
LM377 Dual 2 Watt Stereo Power Amp						•			•		
LM378 Dual 4 Watt Stereo Power Amp						•			•		

LM379 Dual 6 Watt Stereo Power Amp								S	•			
LM380 2 Watt Audio Amp						•	•		•			
LM381/LM381A Low Noise Dual Preamp						•			•			
LM382 Low Noise Dual						•			•			
LM383 5-Lead 8 Watt Audio Power Amp								T	•			
LM384 5 Watt Audio Amp						•			•			
LM386 Low Level Audio Amp							•		•			
LM387/LM387A Low Noise Dual Preamp							•		•			
LM388/LM388A 1.5 Watt Audio Amp						•			•			
LM389 Low Power Audio Amp and RF Transistor Array						•			•			
LM390 1 Watt Audio Amp						•			•			
LM391 High Voltage Audio Driver						•			•			
LM529 Hi Speed Comparator	•	•	•				•		•			
LM555/LM555C Timer	•						•		•			
LM556/LM556C Dual Timer		•	•	•		•			•			
LM565/LM565C Phase Locked Loop	•					•			•			
LM566/LM566C Phase Locked Loop	•						•		•			
LM567/LM567C Tone Decoder	•						•		•			
LM703L IF Limiting Amp												•
LM709A/LM709/LM709C Op Amp	•					•			•			
LM710A/LM710/LM710C Differential Comparator	•					•			•			
LM711/LM711C Dual Differential Comparator	•					•			•			
LM723/LM723C Voltage Regulator	•		•			•			•			
LM725A/LM725/LM725C Op Amp	•				•		•		•			
LM733/LM733C Video Amp	•					•			•			

LINEAR PRODUCT STATUS GUIDE (Continued)

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
LM741A/LM741C/LM741E Compensated Op Amp	•			•	•	•	•		•		
LM746 Chroma Demodulator						•			•		
LM747A/LM747C/LM747E Dual Compensated Op Amp	•	•	•	•		•			•		
LM747-1, LM747-1C Split Pos. Supply Dual Comp. Op Amp											•
LM748/LM748C Op Amp	•			•	•		•		•		
LM760 Hi Speed Comparator											•
LM78XX Positive Voltage Regulator (1A)								K, T	•		
LM78XX 3-Terminal Positive Regulator (0.1A)	•							Z	•		
LM78XX 3-Terminal Positive Regulator (500 mA)								P	•		
LM79XX Negative Voltage Regulator (1A)								K, T	•		
LM79LXX Negative Voltage Regulator (0.1A)								Z	•		
LM79MXX Negative Voltage Regulator (0.5A)	•							P	•		
LM1011 Dolby® B-Type IC						•			•		
LM1011A Dolby B-Type IC						•			•		
LM1011N Dolby						•			•		
LM1011AN Dolby						•			•		
LM1014N Motor Speed Control						•			•		
LM1014AN Motor Speed Control						•			•		
LM1017 4-Bit Binary Det./Driver						•			•		
LM1017N LED Decoder/Driver						•			•		

LM1019 Digital Tuning Station Detector						•			•			
LM1019N Station Detector						•			•			
LM1035N Dual DC Operated Tone/Volume/Bal.						•				•		
LM1036N Mono DC Operated Tone/Volume						•				•		
LM1037N Audio Switch						•				•		
LM1111AN Dolby						•			•			
LM1111BN Dolby						•			•			
LM1111CN Dolby						•			•			
LM1303 Stereo Preamplifier						•			•			
LM1310 Stereo Demodulator						•			•			
LM1351 FM Detector and Limiter												•
LM1391 TV Horizontal Processor							•		•			
LM1394 TV Horizontal Processor												•
LM1408 8-Bit DAC				•		•			•			
LM1414/LM1514 Dual Voltage Comparator				•		•			•			
LM1436/LM1536 High Voltage Op Amp	•								•			
LM1458/LM1558 Dual Compensated Op Amp	•				•	•	•		•			
LM1496/LM1596 Balance Mod/Demodulator	•						•		•			
LM1524/LM2524/LM3524				•			•		•			
LM1800 PLL Stereo Demodulator							•		•			
LM1801 Smoke Detector							•		•			
LM1810 PLL Stereo Demodulator												•
LM1812 Ultrasonic Transceiver							•		•			
LM1815 Adaptive Sense Amplifier							•		•			
LM1818 Tape Playback							•		•			

LINEAR PRODUCT STATUS GUIDE (Continued)

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
LM1820 AM Radio System						•			•		
LM1821 45 MHz IF						•			•		
LM1828 Chroma Demodulator						•			•		
LM1830 Fluid Level Sensor						•			•		
LM1848 Chroma Demodulator											•
LM1850 Ground Fault Interrupter											•
LM1851 Ground Fault Interrupter (to 1979 UL Standard)							•			•	
LM1868 AM/FM IF with Audio Power						•				•	
LM1870 Stereo Demodulator with Blend						•			•		
LM1871 Radio Controlled Transmitter						•			•		
LM1872 Radio Controlled Receiver						•			•		
LM1877 Dual 2 Watt Power Amplifier						•			•		
LM1978											
LM1879											
LM1880 No-Holds Vertical/Horizontal						•			•		
LM1886 TV Video Matrix D/A						•			•		
LM1887/LM2887 24V/12V Chroma System						•			•		
LM1889 TV Video Monitor						•			•		
LM1890 Light-to-Current Converter							•			•	
LM1896											

LM2002 5-Lead 8 Watt Audio Power Amplifier								T		•	
LM2704 Compander						•				•	
LM2808 TV Sound System						•			•		
LM2877P Stereo 3½W Channel SIP								NT	•		
LM2878											
LM2900/LM3900 Quad Amplifier			•			•			•		
LM2901 Quad Comparator						•			•		
LM2902 Quad Op Amp						•			•		
LM2903 Dual Comparator							•		•		
LM2904 Dual Op Amp							•		•		
LM2905/LM3905 Precision Timer							•		•		
LM2906 Frequency to Voltage Converter						•	•		•		
LM2917 Frequency to Voltage Converter						•	•		•		
LM2924 Op Amp and Comparator						•					
LM2930 Low Input to Output Voltage Regulator								P	•		
LM3011 Wide Band Amplifier	•										
LM3045 Trans. Array (Diff. Pair)			•						•		
LM3046 Trans. Array (Diff. Pair)						•			•		
LM3053 Differential Amp											•
LM3064 TV Auto Frequency Control						•			•		
LM3072 Chroma Demodulator						•			•		
LM3075 FM Det/Lim/Audio Preamplifier						•			•		
LM3080 Transconductance Amplifier	•						•		•		
LM3086 Trans Array (Diff. Pair)						•			•		

LINEAR PRODUCT STATUS GUIDE (Continued)

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
LM3089 FM Receiver IF System						•			•		
LM3118/LM3118A Matched Monolith. High Voltage											•
LM3126 TV Chroma Processor						•			•		
LM3145/LM3145A High Volt. Trans. Array			•	•					•		
LM3146/LM3146A High Volt. Trans. Array						•			•		
LM3189 FM/IF						•				•	
LM3301 Quad Op Amp						•			•		
LM3302 Quad Comparator						•		J	•		
LM3401 Quad Op Amp			•			•		J	•		
LM3820 AM Radio System						•			•		
LM3905 Precision Timer			•			•			•		
LM3909 LED Flasher							•		•		
LM3911 Temperature Controller	•						•	Z	•		
LM3914 Dot/Bar Display Driver						•			•		
LM3915 Bar Graph Display Driver 3 dB Step						•			•		
LM3916 VU Bar Graph						•				•	
LM3924 Comparator/Op Amp						•			•		
LM3999 Precision Reference								Z	•		
LM4250/LM4250C Programmable Op Amp	•						•		•		
LM4500A FM Stereo Demodulator							•			•	

LM13600 Dual Op. Trans. Amp with Buffer						•			•		
LM13600N Dual Transconductance Amplifier									•		
LX5600/LX5600X Temp. Transducer											•
LX5700/LX5700X Temp. Transducer											•
TBA120S FM IF and Detector						•			•		
TBA120U FM IF and Detector						•			•		
TBA120T FM IF and Detector						•			•		
TBA440C Video IF and Detector						•			•		
TBA510 Chrominance Control						•			•		
TBA530 R-G-B Matrix						•			•		
TBA540 PAL Oscillator						•			•		
TBA540/Q Reference Combination						•			•		
TBA560C Chrominance/Luminance Control						•			•		
TBA560C/CQ Liminance/Chrominance Control						•			•		
TBA920 Horizontal Timebase						•			•		
TBA920/Q Line Oscillator Combination						•			•		
TBA950 TV Horizontal Proc.						•			•		
TBA950-2 Horizontal Timebase						•			•		
TBA950-2x Horizontal Timebase						•			•		
TBA970 Luminance Control						•			•		
TBA990 PAL Demodulator						•			•		
TBA990/Q Color Demodulator						•			•		
TDA120S FM IF and Detector						•			•		
TDA440 Video IF and Control						•			•		

LINEAR PRODUCT STATUS GUIDE (Continued)

Device Types/Product Description	Package Combinations								Availability		
	Metal Can	Flatpack	Cavity DIP			Molded DIP		Other	In Production	Future Product	Obsolete
	H	F	D	J	J-8	N	N-8				
TDA2522 PAL Oscillator and Demodulator						•				•	
TDA2523 PAL Oscillator and Demodulator						•				•	
TDA2530 R-G-B Matrix						•				•	
TDA2531 R-G-B Matrix Preamplifier										•	
TDA2540 Video IF and Detector						•				•	
TDA2541 Video IF and Detector						•				•	
TDA2560 Liminance and Chrominance Control Combination						•				•	
TDA2590 Horizontal Timebase						•				•	
TDA2591 Horizontal Timebase						•				•	
TDA2593 Horizontal Timebase						•				•	
TDA3500 R-G-B Processor						•				•	
TDA3501 R-G-B Processor						•				•	
TDA3510 PAL Decoder						•				•	
TDA3521 SECAM Decoder						•				•	
TP3000 CODEC System									•		
TP3001 μ-Law CODEC System (LF3700 and MM58100)									•		
TP3002 A-Law CODEC System (LF3700 and MM58150)									•		

Note: BI-FET is a trademark of National Semiconductor Corp.

Device No.	Function	National Direct Replacement
FAIRCHILD		
μA101AFM	General Purpose Op Amp	LM101AF
μA101AHM	General Purpose Op Amp	LM101AH
μA102HM	Voltage Follower	LM102H
μA104HM	Negative Voltage Regulator	LM104H
μA105HM	Voltage Regulator	LM105H
μA107HM	General Purpose Op Amp	LM107H
μA108AHM	Super Beta Op Amp	LM108AH
μA108HM	Super Beta Op Amp	LM108H
μA110HM	Voltage Comparator	LM110H
μA111HM	Voltage Comparator	LM111H
μA111RM	Voltage Comparator	LM111J-8
μA201AHM	General Purpose Op Amp	LM201AH
μA201AT	General Purpose Op Amp	LM201AN
μA207HM	General Purpose Op Amp	LM207H
μA208AHM	Super Beta Op Amp	LM208AH
μA208HM	Super Beta Op Amp	LM208H
μA301AHC	General Purpose Op Amp	LM301AH
μA301ATC	General Purpose Op Amp	LM301AN
μA302HC	Voltage Follower	LM302H
μA304HC	Negative Voltage Regulator	LM304H
μA305AHC	Voltage Regulator	LM305AH
μA305HC	Voltage Regulator	LM305H

Device No.	Function	National Direct Replacement
FAIRCHILD		
μA307HC	General Purpose Op Amp	LM307H
μA307TC	General Purpose Op Amp	LM307N
μA308AHC	Super Beta Op Amp	LM308AH
μA308HC	Super Beta Op Amp	LM308H
μA309KC	5 Volt Regulator	LM309KC
μA310HC	Voltage Follower	LM310H
μA311HC	Voltage Comparator	LM311H
μA311R	Voltage Comparator	LM311J-8
μA311TC	Voltage Comparator	LM311N
μA324PC	Quad Op Amp	LM324N
μA339APC	Quad Comparator	LM339AN
μA339PC	Quad Comparator	LM339N
μA376TC	Voltage Regulator	LM376N
μA555HC	Single Timing Circuit	LM555CH
μA555HM	Single Timing Circuit	LM555H
μA555TC	Single Timing Circuit	LM555CN
μA556PC	Dual Timing Circuit	LM556CN
μA709AHM	High Performance Op Amp	LM709AH
μA709HC	High Performance Op Amp	LM709CH
μA709HM	High Performance Op Amp	LM709H
μA709PC	High Performance Op Amp	LM709CN
μA709TC	High Performance Op Amp	LM709CN-8

LINEAR CROSS REFERENCE GUIDE (Continued)

Device No.	Function	National Direct Replacement
FAIRCHILD		
μA710FM	High Speed Differential Comparator	LM710F
μA710HC	High Speed Differential Comparator	LM710CH
μA710HM	High Speed Differential Comparator	LM710H
μA710PC	High Speed Differential Comparator	LM710CN
μA711HC	Dual Comparator	LM711CH
μA711HM	Dual Comparator	LM711H
μA711PC	Dual Comparator	LM711CN
μA723DC	Precision Voltage Regulator	LM723CJ
μA723DM	Precision Voltage Regulator	LM723J
μA723HC	Precision Voltage Regulator	LM723CH
μA723HM	Precision Voltage Regulator	LM723H
μA723PC	Precision Voltage Regulator	LM723CN
μA725AHM	Instrumentation Op Amp	LM725AH
μA725HC	Instrumentation Op Amp	LM725CH
μA725HM	Instrumentation Op Amp	LM725H
μA733HC	Differential Video	LM733CH
μA733HM	Differential Video	LM733H
μA741AFM	Frequency Compensated Op Amp	LM741AF
μA741AHM	Frequency Compensated Op Amp	LM741AH
μA741DC	Frequency Compensated Op Amp	LM741CJ-14
μA741EHC	Frequency Compensated Op Amp	LM741EH

Device No.	Function	National Direct Replacement
FAIRCHILD		
μAF156AHM	Wideband Mono. JFET Input Op Amp	LF156AH
μAF156HM	Wideband Mono. JFET Input Op Amp	LF156H
μAF157AHM	Wideband Mono. JFET Input Op Amp	LF157AH
μAF157HM	Wideband Mono. JFET Input Op Amp	LF157H
μAF211HM	Voltage Comparator	LF211H
μAF311HC	Voltage Comparator	LF311H
μAF355AHC	Monolithic JFET Input Op Amp	LF355AH
μAF355HC	Monolithic JFET Input Op Amp	LF355H
μAF356AHC	Wideband Mono JFET Input Op Amp	LF356AH
μAF356HC	Wideband Mono JFET Input Op Amp	LF356H
μAF357AHC	Wideband Mono JFET Input Op Amp	LF357AH
μAF357HC	Wideband Mono JFET Input Op Amp	LF357H

Device No.	Function	National Direct Replacement
MOTOROLA		
LF155AH	Monolithic JFET Op Amp	LF155AH
LF155H	Monolithic JFET Op Amp	LF155H
LF156AH	Monolithic JFET Op Amp	LF156AH

μA741PC	Frequency Compensated Op Amp	LM741CN-14
μA741RC	Frequency Compensated Op Amp	LM741CJ
μA741TC	Frequency Compensated Op Amp	LM741CN
μA746PC	Chroma Demodulator	LM746N
μA747AHM	Dual Frequency Compensated Op Amp	LM747AH
μA747EHC	Dual Frequency Compensated Op Amp	LM747EH
μA747HC	Dual Frequency Compensated Op Amp	LM747CH
μA747HM	Dual Frequency Compensated Op Amp	LM747H
μA747PC	Dual Frequency Compensated Op Amp	LM747CN
μA748HC	Op Amp	LM748CH
μA748HM	Op Amp	LM748H
μA748TC	Op Amp	LM748CN
μA760HC	High Speed Differential Comparator	LM760CH
μA796HC	3-Terminal Positive Voltage Regulator	LM1496H
μA796PC	3-Terminal Positive Voltage Regulator	LM1496M
μA798HM	Dual Op Amp	LM358H
μA1558HM	Dual Internally Compensated Op Amp	LM1558H
μA2901PC	Dual Internally Compensated Op Amp	LM2901N
μA3046DC	Transistor Array	LM3046N
μA3064PC	TV Automatic Fine-Tuning Circuit	LM3064N
μA3075PC	FM IF Limiter/Detector/Audio Preamplifier	LM3075N
μA3086PC	Transistor Array	LM3086N
μA3301P	Quad Single Supply Amplifier	LM3301N
μA3302P	Quad Comparator	LM3302N
μA3401P	Quad Single Supply Amplifier	LM3401N
μAF111HM	Voltage Comparator	LF111H
μAF155AHM	Monolithic JFET Input Op Amp	LF155AH
μAF155HM	Monolithic JFET Input Op Amp	LF155H

LF157H	Monolithic JFET Op Amp	LF157H
LF355AH	Monolithic JFET Op Amp	LF355AH
LF355H	Monolithic JFET Op Amp	LF355H
LF355N	Monolithic JFET Op Amp	LF355N
LF356AH	Monolithic JFET Op Amp	LF356AH
LF356H	Monolithic JFET Op Amp	LF356H
LF356N	Monolithic JFET Op Amp	LF356N
LM117H	3-Terminal Adj. Positive Regulator	LM117H
LM117K	3-Terminal Adj. Positive Regulator	LM117K
LM123K	Positive Voltage Regulator	LM123K
LM317H	3-Terminal Adj. Positive Regulator	LM317H
LM317K	3-Terminal Adj. Positive Regulator	LM317K
LM317T	3-Terminal Adj. Positive Regulator	LM317T
MC1303P	Dual Stereo Preamplifier	LM1303N
MC1310P	FM Stereo Demodulator	LM1310N
MC1408L6	8-Bit Multiplying D/A Converter	LM1408J-6
MC1408L7	8-Bit Multiplying D/A Converter	LM1408J-7
MC1408L8	8-Bit Multiplying D/A Converter	LM1408J-8
MC1408P6	8-Bit Multiplying D/A Converter	LM1408N-6
MC1408P7	8-Bit Multiplying D/A Converter	LM1408N-7
MC1408P8	8-Bit Multiplying D/A Converter	LM1408N-8
MC1414L	Dual Differential Comparator	LM1414J
MC1414P	Dual Differential Comparator	LM1414N
MC1496G	Balanced Modulator-Demodulator	LM1496H
MC1496P	Balanced Modulator-Demodulator	LM1496N
MC1508L8	8-Bit Multiplying D/A Converter	LM1508D-8
MC1514L	Dual Differential Comparator	LM1514J
MC1596G	Blanced Modulator-Demodulator	LM1596H

LINEAR CROSS REFERENCE GUIDE (Continued)

Device No.	Function	National Direct Replacement
MOTOROLA		
MC1710AG	Differential Comparator	LM710AH
MC1710CG	Differential Comparator	LM710CH
MC1710CP	Differential Comparator	LM710CN
MC1710G	Differential Comparator	LM710H
MC1711CG	Dual Differential Comparator	LM711CH
MC1711CP	Dual Differential Comparator	LM711CN
MC1711G	Dual Differential Comparator	LM711H
MC1723CL	Adj. Positive or Negative Volt. Regulator	LM723CJ
MC1723CP	Adj. Positive or Negative Volt. Regulator	LM723CN
MC1723L	Adj. Positive or Negative Volt. Regulator	LM723J
MC1733CG	Differential Video Amp	LM733CH
MC1733CP	Differential Video Amp	LM733CN
MC1733G	Differential Video Amp	LM733H
MC1741CG	General Purpose Op Amp	LM741CH
MC1741CL	General Purpose Op Amp	LM741CJ-14
MC1741CP1	General Purpose Op Amp	LM741CN
MC1741CP2	Generla Purpose Op Amp	LM741CN-14
MC1741G	General Purpose Op Amp	LM741H
MC1741L	General Purpose Op Amp	LM741J-14
MC1741U	General Purpose Op Amp	LM741J
MC1747CG	Dual MC1741 Op Amp	LM747CH
MC1747CL	Dual MC1741 Op Amp	LM747CJ

Device No.	Function	National Direct Replacement
MOTOROLA		
MLM108AG	Precision Op Amp	LM108AH
MLM108AU	Precision Op Amp	LM108AJ
MLM109G	Positive Voltage Regulator	LM109H
MLM110G	Unity Gain Op Amp	LM110H
MLM110U	Unity Gain Op Amp	LM110J-8
MLM111G	Voltage Comparator	LM111H
MLM111L	Voltage Comparator	LM111J
MLM111U	Voltage Comparator	LM111J-8
MLM124L	Quad Op Amp	LM124J
MLM124P	Quad Op Amp	LM124N
MLM139AL	Quad Comparator	LM139AJ
MLM139L	Quad Comparator	LM139J
MLM158G	Dual Op Amp	LM158H
MLM201AG	General Purpose Op Amp	LM201AH
MLM201API	General Purpose Op Amp	LM201AN
MLM204G	Adjustable Negative Voltage Regulator	LM204H
MLM205G	Adjustable Positive Voltage Regulator	LM205H
MLM207G	General Purpose Op Amp	LM207H
MLM207U	General Purpose Op Amp	LM207J
MLM208AG	Precision Op Amp	LM208AH
MLM208AL	Precision Op Amp	LM208AJ

MC1747L	Dual MC1741 Op Amp	LM747J
MC1748CG	General Purpose Op Amp	LM748CH
MC1748CP1	General Purpose Op Amp	LM748CN
MC1748CU	General Purpose Op Amp	LM748CJ
MC1748G	General Purpose Op Amp	LM748H
MC1748U	General Purpose Op Amp	LM748J
MC2901P	Quad Comparator	LM2901N
MC2902P	Quad Op Amp	LM2902N
MC3301P	Quad Op Amp	LM3301N
MC3302P	Quad Comparator	LM3302N
MC3401P	Quad Op Amp	LM3401N
MC78XXCK	Positive Voltage Regulator	LM78XXCK
MC78XXCT	Positive Voltage Regulator	LM78XXCT
MC78LXXACG	Positive Voltage Regulator	LM78LXXACH
MC78LXXACP	Positive Voltage Regulator	LM78LXXACZ
MC78LXXCG	Positive Voltage Regulator	LM78LXXCH
MC78LXXCP	Positive Voltage Regulator	LM78LXXCZ
MC79XXCK	Negative Voltage Regulator	LM79XXCK
MC79XXCT	Negative Voltage Regulator	LM79XXCT
MC79LXXACP	Negative Voltage Regulator	LM79LXXACZ
MC79LXXCP	Negative Voltage Regulator	LM79LXXCZ
MLM101AG	Gen. Purpose Adj. Op Amp	LM101AH
MLM101AU	Gen. Purpose Adj. Op Amp	LM101AJ
MLM104G	Adjustable Negative Volt. Regulator	LM104H
MLM105G	Adjustable Positive Volt. Regulator	LM105H
MLM107G	General Purpose Op Amp	LM107H
MLM107U	General Purpose Op Amp	LM107J
MLM208U	Precision Op Amp	LM208J-8
MLM209G	Positive Voltage Regulator	LM209H
MLM211G	Voltage Comparator	LM211H
MLM211L	Voltage Comparator	LM211J
MLM211U	Voltage Comparator	LM211J-8
MLM224L	Quad Op Amp	LM224J
MLM239AL	Quad Comparator	LM239AJ
MLM239L	Quad Comparator	LM239J
MLM258G	Dual Op Amp	LM258H
MLM301AG	General Purpose Op Amp	LM301AH
MLM301API	General Purpose Op Amp	LM301AN
MLM304G	Adjustable Negative Voltage Regulator	LM304H
MLM305G	Adjustable Positive Voltage Regulator	LM305H
MLM307G	General Purpose Op Amp	LM307H
MLM307PI	General Purpose Op Amp	LM307N
MLM307U	General Purpose Op Amp	LM307J
MLM308AG	Precision Op Amp	LM308AH
MLM308AL	Precision Op Amp	LM308AJ
MLM308API	Precision Op Amp	LM308AN
MLM308AU	Precision Op Amp	LM308AJ-8
MLM308G	Precision Op Amp	LM308H
MLM308L	Precision Op Amp	LM308J
MLM308PI	Precision Op Amp	LM308N
MLM308U	Precision Op Amp	LM308J-8
MLM309G	Positive Voltage Regulator	LM309H
MLM309K	Positive Voltage Regulator	LM309K
MLM310G	Unity Gain Op Amp	LM310H

LINEAR CROSS REFERENCE GUIDE (Continued)

Device No.	Function	National Direct Replacement
MOTOROLA		
MLM310PI	Unity Gain Op Amp	LM310N
MLM310U	Unity Gain Op Amp	LM310J-8
MLM311G	Voltage Comparator	LM311H
MLM311L	Voltage Comparator	LM311J
MLM311PI	Voltage Comparator	LM311N
MLM311U	Voltage Comparator	LM311J-8
MLM324L	Quad Op Amp	LM324J
MLM324P	Quad Op Amp	LM324N
MLM339AL	Quad Comparator	LM339AJ
MLM339AP	Quad Comparator	LM339AN
MLM339L	Quad Comparator	LM339J
MLM339P	Quad Comparator	LM339N
MLM358G	Dual Op Amp	LM358H
MLM358PI	Dual Op Amp	LM358N
MLM565CP	Phase Locked Loop	LM565CN

Device No.	Function	National Direct Replacement
PMI		

Device No.	Function	National Direct Replacement
SIGNETICS		
μA709AT	Operational Amplifier	LM709AH
μA709CN	Operational Amplifier	LM709CN-8
μA709CN-14	Operational Amplifier	LM709CN
μA709CT	Operational Amplifier	LM709CH
μA709T	Operational Amplifier	LM709H
μA710CN-14	Differential Voltage Comparator	LM710CN
μA710CT	Differential Voltage Comparator	LM710CH
μA710T	Differential Voltage Comparator	LM710H
μA711CN	Dual Voltage Comparator	LM711CN
μA711CT	Dual Voltage Comparator	LM711CH
μA711K	Dual Voltage Comparator	LM711H
μA723CF	Precision Voltage Regulator	LM723CJ
μA723CL	Precision Voltage Regulator	LM723CH
μA723CN	Precision Voltage Regulator	LN723CN
μA723F	Precision Voltage Regulator	LM723J
μA723L	Precision Voltage Regulator	LM723H
μA733CN	Differential Video Amp	LM733CN
μA733CT	Differential Video Amp	LM733CH
μA733F	Differential Video Amp	LM733H
μA741CF	General Purpose Op Amp	LM741CJ-14
μA741CN	General Purpose Op Amp	LM741CN

PM156AJ	JFET Input Op Amp	LF156AH
PM156J	JFET Input Op Amp	LF156H
PM157AJ	JFET Input Op Amp	LF157AH
PM157J	JFET Input Op Amp	LF157H
PM208AJ	Operational Amplifier	LM208AH
PM208J	Operational Amplifier	LM208H
PM255J	JFET Input Op Amp	LF255H
PM256J	JFET Input Op Amp	LF256H
PM257J	JFET Input Op Amp	LF257H
PM308AJ	Operational Amplifier	LM308AH
PM308J	Operational Amplifier	LM308H
PM355AJ	JFET Input Op Amp	LF355AH
PM355J	JFET Input Op Amp	LF355H
PM356AJ	JFET Input Op Amp	LF356AH
PM356J	JFET Input Op Amp	LF356H
PM357AJ	JFET Input Op Amp	LF357AH
PM357J	JFET Input Op Amp	LF357H
PM725CJ	Operational Amplifier	LM725CH
PM725J	Operational Amplifier	LM725H
PM741CJ	Compensated Op Amp	LM741CH
PM741J	Compensated Op Amp	LM741H
PM747CJ	Dual Compensated Op Amp	LM747CH
PM747J	Dual Compensated Op Amp	LM747H
PM1558J	Dual Compensated Op Amp	LM1558H

[illegible]	[illegible]	[illegible]
μA747CN	Dual Op Amp	LM747CN
μA748CF	General Purpose Op Amp	LM748CJ
μA748CN	General Purpose Op Amp	LM748CN
μA748CT	General Purpose Op Amp	LM748CH
μA748F	General Purpose Op Amp	LM748J-14
μA748T	General Purpose Op Amp	LM748H
78XXCU	3-Terminal Positive Voltage Regulator	LM78XXCT
78XXDA	3-Terminal Positive Voltage Regulator	LM78XXCK
78LXXACS	3-Terminal Positive Voltage Regulator	LM78XXACZ
78LXXADB	3-Terminal Positive Voltage Regulator	LM78LXXACH
78LXXCDB	3-Terminal Positive Voltage Regulator	LM78LXXCH
78LXXCS	3-Terminal Positive Voltage Regulator	LM78LXXCZ
79XXCU	3-Terminal Negative Voltage Regulator	LM79XXCT
79XXDA	3-Terminal Negative Voltage Regulator	LM79XXCK
LF155AT	Hi Performance JFET Input Op Amp	LF155AH
LF155T	Hi Performance JFET Input Op Amp	LF155H
LF156AT	Hi Performance JFET Input Op Amp	LF156AH
LF156T	Hi Performance JFET Input Op Amp	LF156H
LF157AT	Hi Performance JFET Input Op Amp	LF157AH
LF157T	Hi Performance JFET Input Op Amp	LF157H
LF255T	Hi Performance JFET Input Op Amp	LF255H
LF256T	Hi Performance JFET Input Op Amp	LF256H
LF257T	Hi Performance JFET Input Op Amp	LF257H
LF355AT	Hi Performance JFET Input Op Amp	LF355AH

LINEAR CROSS REFERENCE GUIDE (Continued)

Device No.	Function	National Direct Replacement
SIGNETICS		
LF355T	Hi Performance JFET Input Op Amp	LF355H
LF356AT	Hi Performance JFET Input Op Amp	LF356AH
LF356T	Hi Performance JFET Input Op Amp	LF356H
LF357AT	Hi Performance JFET Input Op Amp	LF357AH
LF357T	Hi Performance JFET Input Op Amp	LF357H
LM101AF	High Performance Amplifier	LM101AJ-14
LM101AT	High Performance Amplifier	LM101AH
LM107F	General Purpose Op Amp	LM107J-14
LM107T	General Purpose Op Amp	LM107H
LM108AF	Precision Op Amp	LM108AJ
LM108AT	Precision Op Amp	LM108AH
LM108F	Precision Op Amp	LM108J
LM108T	Precision Op Amp	LM108H
LM109DB	5 Volt Regulator	LM109H
LM111F	Voltage Comparator	LM111J
LM111T	Voltage Comparator	LM111H
LM119F	Dual Voltage Comparator	LM119J
LM119K	Dual Voltage Comparator	LM119H
LM124AF	Gen Purpose Single Supply Op Amp	LM124AJ
LM124F	Gen Purpose Single Supply Op Amp	LM124J

Device No.	Function	National Direct Replacement
SIGNETICS		
LM307T	General Purpose Op Amp	LM307H
LM308AF	Precision Op Amp	LM308AJ
LM308AN	Precision Op Amp	LM308AN
LM308AT	Precision Op Amp	LM308AH
LM308F	Precision Op Amp	LM308J
LM308N	Precision Op Amp	LM308N
LM308T	Precision Op Amp	LM308H
LM309DA	5 Volt Regulator	LM309K
LM309DB	5 Volt Regulator	LM309H
LM311F	Voltage Comparator	LM311J
LM311N	Voltage Comparator	LM311N
LM311N-14	Voltage Comparator	LM311N-14
LM311T	Voltage Comparator	LM311H
LM319F	Dual Voltage Comparator	LM319J
LM319K	Dual Voltage Comparator	LM319H
LM319N	Dual Voltage Comparator	LM319N
LM324AF	Gen Purpose Single Supply Op Amp	LM324AJ
LM324AN	Gen Purpose Single Supply Op Amp	LM324AN
LM324F	Gen Purpose Single Supply Op Amp	LM324J
LM324N	Gen Purpose Single Supply Op Amp	LM324N

LM193T	Low Power Dual Voltage Comparator	LM193H
LM201AF	High Performance Amplifier	LM201AJ-14
LM201AN	High Performance Amplifier	LM201AN
LM201AT	High Performance Amplifier	LM201H
LM207F	General Purpose Op Amp	LM207J-14
LM207T	General Purpose Op Amp	LM207H
LM208AF	General Purpose Op Amp	LM208AJ
LM208AT	Precision Operational Amp	LM208AH
LM208F	Precision Operational Amp	LM208J
LM208T	Precision Operational Amp	LM208H
LM209DB	5 Volt Regulator	LM209H
LM211F	Voltage Comparator	LM211J
LM211T	Voltage Comparator	LM211H
LM219F	Dual Voltage Comparator	LM219J
LM219K	Dual Voltage Comparator	LM219H
LM224AF	Gen Purpose Single Supply Op Amp	LM224AJ
LM224AN	Gen Purpose Single Supply Op Amp	LM224AN
LM224F	Gen Purpose Single Supply Op Amp	LM224J
LM239AF	Quad Voltage Comparator	LM239AJ
LM239F	Quad Voltage Comparator	LM239J
LM258T	Gen Purpose Single Supply Op Amp	LM258H
LM293T	Low Power Dual Voltage Comparator	LM293H
LM301AF	High Performance Amplifier	LM301AJ-14
LM301AN	High Performance Amplifier	LM301AN
LM301AT	High Performance Amplifier	LM301H
LM307F	General Purpose Op Amp	LM307J-14
LM307N	General Purpose Op Amp	LM307N
LM340XXDA	3-Terminal Positive Voltage Regulator	LM340KXX
LM340XXLL	3-Terminal Positive Voltage Regulator	LM340TXX
LM381AN	Dual Low Noise Preamplifier	LM381AN
LM381N	Dual Low Noise Preamplifier	LM381N
LM382N	Dual Low Noise Preamplifier	LM382N
LM387N	Dual Low Noise Preamplifier	LM387N
LM393AN	Low Power Dual Voltage Comparator	LM393AN
LM393AT	Low Power Dual Voltage Comparator	LM393AH
LM393N	Low Power Dual Voltage Comparator	LM393N
LM393T	Low Power Dual Voltage Comparator	LM393H
LM2901F	Quad Voltage Comparator	LM2901J
LM2901N	Quad Voltage Comparator	LM2901N
LM2903N	Low Power Dual Voltage Comparator	LM2903N
MC1408-7F	8-Bit Multiplying D/A Converter	LM1407J-7
MC1408-8F	8-Bit Multiplying D/A Converter	LM1408J-8
MC1408-7N	8-Bit Multiplying D/A Converter	LM1408N-7
MC1408-8N	8-Bit Multiplying D/A Converter	LM1408N-8
MC1496K	Balanced Modulator Demodulator	LM1496H
MC1496N	Balanced Modulator Demodulator	LM1496N
MC1596K	Balanced Modulator Demodulator	LM1596H
MC3302N	Quad Voltage Comparator	LM3302N
NE555T	Timer	LM555CH
NE555N	Timer	LM555CN
NE556N	Dual Timer	LM556CN
NE556F	Dual Timer	LM556J
NE565K	Phase Locked Loop	LM565CH
NE565N	Phase Locked Loop	LM565CN

LINEAR CROSS REFERENCE GUIDE (Continued)

Device No.	Function	National Direct Replacement
SIGNETICS		
NE566N	Function Generator	LM566CN
NE567T	Tone Decoder/Phase Locked Loop	LM567CH
NE567N	Tone Decoder/Phase Locked Loop	LM567CN
SE555T	Timer	LM555H
SE565K	Phase Locked Loop	LM565H
SE567T	Tone Decoder/Phase Locked Loop	LM567H
TBA120N	FM IF Amp & Demodulator	TBA120T
TBA120S-2	8-Stage Amp w/Balanced Demodulator	TBA120S II
TBA120S-3	8-Stage Amp w/Balanced Demodulator	TBA120S III
TBA120S-4	8-Stage Amp w/Balanced Demodulator	TBA120S IV
TBA120S-5	8-Stage Amp w/Balanced Demodulator	TBA120S V
TBA120SN	8-Stage w/Balanced Demodulator	TBA120SQ
TBA120S-2N	8-Stage w/Balanced Demodulator	TBA120SQ II
TBA120S-3N	8-Stage w/Balanced Demodulator	TBA120SQ III
TBA120S-4N	8-Stage w/Balanced Demodulator	TBA120SQ IV
TBA120S-5N	8-Stage w/Balanced Demodulator	TBA120SQ V
TBA120U	FM IF Amp & Demodulator	TBA120U
TBA120UN	FM IF Amp & Demodulator	TBA120UQ

Device No.	Function	National Direct Replacement
TEXAS INSTRUMENTS		
μA741ML	Compensated Op Amp	LM741H
μA748CJG	Op Amp	LM748CJ
μA748CL	Op Amp	IM748CH
μA748CN	Op Amp	LM748CN
μA748MJ	Op Amp	LM748J-14
μA748MJG	Op Amp	LM748J
μA748ML	Op Amp	LM748H
μA78XXCKA	Positive Voltage Regulator	LM78XXCK
μA78XXCKC	Positive Voltage Regulator	LM78XXCT
μA78LXXACL	Positive Voltage Regulator	LM78LXXACZ
μA78LXXCLP	Positive Voltage Regulator	LM78LXXCZ
μA78MXXCKD	Positive Voltage Regulator	LM78MXXCP
μA79XXCKA	Negative Voltage Regulator	LM79XXCK
μA79XXCKC	Negative Voltage Regulator	LM79XXCT
μA79MXXCKD	Negative Voltage Regulator	LM79MXXCP
μA79MXXCLA	Negative Voltage Regulator	LM79MXXCH
μA79MXXLA	Negative Voltage Regulator	LM79MXXH
LF155AL	JFET Input Op Amp	LF155AH

		Replacement
TEXAS INSTRUMENTS		
μA70AML	Op Amp	LM709AH
μA709CL	Op Amp	LM709CH
μA709CN	Op Amp	LM709CN
μA709CP	Op Amp	LM709CN-8
μA709ML	Op Amp	LM709H
μA710ML	Comparator	LM710H
μA711CL	Dual Comparator	LM711CH
μA711CN	Dual Comparator	LM711CN
μA711ML	Dual Comparator	LM711H
μA723CJ	Voltage Regulator	LM723CJ
μA723CL	Voltage Regulator	LM723CH
μA723CN	Voltage Regulator	LM723CN
μA723MJ	Voltage Regulator	LM723J
μA723ML	Voltage Regulator	LM723H
μA733CL	Video Amp	LM733CH
μA733CN	Video Amp	LM733CN
μA733ML	Video Amp	LM733H
μA741CJ	Compensated Op Amp	LM741CJ-14
μA741CJ	Compensated Op Amp	LM741CN-14
μA741CJG	Compensated Op Amp	LM741CJ
μA741CL	Compensated Op Amp	LM741CH
μA741CP	Compensated Op Amp	LM741CN
μA741MJ	Compensated Op Amp	LM741J-14
μA741MJG	Compensated Op Amp	LM741J
LF156L	JFET Input Op Amp	LF156H
LF157AL	JFET Input Op Amp	LF157AH
LF157L	JFET Input Op Amp	LF157H
LF255L	JFET Input Op Amp	LF255H
LF256L	JFET Input Op Amp	LF256H
LF257L	JFET Input Op Amp	LF257H
LF355AL	JFET Input Op Amp	LF355AH
LF355L	JFET Input Op Amp	LF355H
LF355P	JFET Input Op Amp	LF355N
LF356AL	JFET Input Op Amp	LF356AH
LF356L	JFET Input Op Amp	LF356H
LF356P	JFET Input Op Amp	LF356N
LM101AJ	Improved Op Amp	LM101AJ-14
LM101AJG	Improved Op Amp	LM101AJ
LM101AL	Improved Op Amp	LM101AH
LM101AU	Improved Op Amp	LM101AF
LM104L	Negative Voltage Regulator	LM104H
LM105L	Positive Voltage Regulator	LM105H
LM106L	Voltage Comparator	LM106H
LM107J	Compensated Op Amp	LM107J-14
LM107JG	Compensated Op Amp	LM107J
LM107L	Compensated Op Amp	LM107H
LM109LA	5V Regulator	LM109H
LM111J	Voltage Comparator	LM111J
LM111JG	Voltage Comparator	LM111J-8
LM111L	Voltage Comparator	LM111H
LM117KA	3-Terminal Adjustable Regulator	LM117K

LINEAR CROSS REFERENCE GUIDE (Continued)

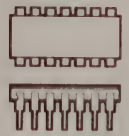
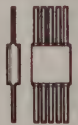
Device No.	Function	National Direct Replacement
TEXAS INSTRUMENTS		
LM117LA	3-Terminal Adjustable Regulator	LM117H
LM118JG	High Slew Rate Op Amp	LM118J
LM118L	High Slew Rate Op Amp	LM118H
LM124J	Quad Op Amp	LM124J
LM124N	Quad Op Amp	LM1$24N
LM139J	Quad Comparator	LM139J
LM158L	Dual Op Amp	¢LM158H
LM193L	Dual Comparator	LM193H
LM201AJ	Improved Op Amp	LM201AJ-14
LM201AJG	Improved Op Amp	LM201AJ
LM201AL	Improved Op Amp	LM201AH
LM201AN	Improved Op Amp	LM201AN
LM204L	Negative Voltage Regulator	LM204H
LM205L	Positive Voltage Regulator	LM205H
LM206L	Voltage Comparator	LM206H
LM207J	Compensated Op Amp	LM207J-14
LM207JG	Compensated Op Amp	LM207J
LM207L	Compensated Op Amp	LM207H
LM209LA	5V Regulator	LM209H
LM217H	3-Terminal Adjustable Regulator	LM217LA

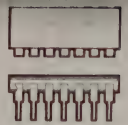
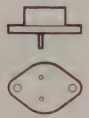
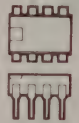
Device No.	Function	National Direct Replacement
TEXAS INSTRUMENTS		
LM309LA	5V Regulator	LM309H
LM311J	Voltage Comparator	LM311J
LM311JG	Voltage Comparator	LM311J-8
LM311L	Voltage Comparator	LM311H
LM311N	Voltage Comparator	LM311N-14
LM311P	Voltage Comparator	LM311N
LM317KA	3-Terminal Adjustable Regulator	LM317K
LM317KC	3-Terminal Adjustable Regulator	LM317T
LM317LA	3-Terminal Adjustable Regulator	LM317H
LM318JG	High Slew Rate Op Amp	LM318J-8
LM318L	High Slew Rate Op Amp	LM318H
LM318P	High Slew Rate Op Amp	LM318N
LM324J	Quad Op Amp	LM324J
LM324N	Quad Op Amp	LM324N
LM339J	Quad Comparator	LM339J
LM339N	Quad Comparator	LM339N
LM358L	Dual Op Amp	LM358H
LM358P	Dual Op Amp	LM358N
LM376P	Positive Voltage Regulator	LM376N
LM393L	Dual Comparator	LM393H

LM258L	Dual Op Amp	LM258H
LM293L	Dual Comparator	LM293H
LM301AJ	Improved Op Amp	LM301AJ-14
LM301AJG	Improved Op Amp	LM301AJ
LM301AL	Improved Op Amp	LM301AH
LM301AN	Improved Op Amp	LM301AN
LM304L	Negative Voltage Regulator	LM3034H
LM305AL	Positive Voltage Regulator	LM305AH
LM305L	Positive Voltage Regulator	LM305H
LM306L	Voltage Comparator	LM306H
LM307J	Compensated Op Amp	LM307J-14
LM307JG	Compensated Op Amp	LM307J
LM307L	Compensated Op Amp	LM307H
LM307N	Compensated Op Amp	LM307N

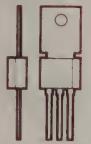
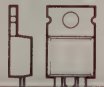
LM2903P	Dual Comparator	LM2903N
LM2904P	Dual Op Amp	LM2904N
MC1558JG	Dual Compensated Op Amp	LM1558J
MC1558L	Dual Compensated Op Amp	LM155I8H
NE555CJG	Timer	LM555CJ
NE555CL	Timer	LM555CH
SE555JG	Timer	LM555J
SE555L	Timer	LM555H
TL081ACL	Single Low Cost Bi-Fet Op Amp	LF351AH
TL081ACN	Single Low Cost Bi-Fet Op Amp	LF351AN
TL081CL	Single Low Cost Bi-Fet Op Amp	LF351H
TL081CN	Single Low Cost Bi-Fet Op Amp	LF351N
TL710CL	Comparator	LM710CH
TL710CN	Comparator	LM710CN

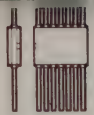
LINEAR CROSS REFERENCE GUIDE (Continued)

	NSC	Signetics	Fairchild	Motorola	TI	RCA	Silicon General	AMD	Raytheon
 14/16 Lead Glass/Metal DIP	D	I	D	L		D	D		D, M
 Glass/Metal Flat-Pack	F	Q	F	F	U W	K	F	F	J, F, Q,
TO-99, TO-100, TO-5	H	T K, L,	H	G	L LA	S* V1**	T	H	T, H

	8, 14 and 16-Lead Low-Temperature Ceramic DIP	J	F	R, D	U	J JG			D	DC, DD
	(Steel) TO-3	K			KS			K		K
	(Aluminum)	KC	DA	K	K	K		K		LK, TK
	8, 14 and 16-Lead Plastic DIP	N	V, A, B N-14	T, P	P	P, N	E	M, N	PC	N, DN, DP, MP

LINEAR CROSS REFERENCE GUIDE (Continued)

	NSC	Signetics	Fairchild	Motorola	TI	RCA	Silicon General	AMD	Raytheon
 TO-202 (D-40, Durawatt)	P				KD				
"SGS" Type Power DIP	S		BP						
 TO-220	T	U	U		KC				

	Low Temperature Glass Hermetic Flat Pack	W		F	F	W			FM	
	TO-92 (Plastic)	Z	S	W	P	LP				

BI-FET PRODUCT SELECTION GUIDE

COMPARISON OF ELECTRICAL CHARACTERISTICS

Part Number	DC Electrical Characteristics: V_{OS}—Max Offset Voltage (mV) (T_A = 25°C)	DC Electrical Characteristics: $\Delta V_{OS}/\Delta T$—T.C. of V_{OS} (μV/°C) Typ	DC Electrical Characteristics: I_B—Max Bias Current (pA) (T_J = 25°C)	AC Electrical Characteristics: A_{VOL} Large Signal Voltage Gain (V/mV) Min (T_A = 25°C)	AC Electrical Characteristics: SR—Slew Rate (V/μs)	AC Electrical Characteristics: e_n—Equiv. Input Noise Voltage (nV/$\sqrt{Hz}$) (Note 2)
Military BI-FET Op Amp (Note 1)						
LF155	5	5	100	50	5	20
LF155A	2	5 (max)	50	50	5	20
LF156	5	5	100	50	12	12
LF156A	2	5 (max)	50	50	12	12
LF157	5	5	100	50	50	12
LF157A	2	5 (max)	50	50	50	12
LFT155	0.5	5 (max)	50	50	5	20
LFT156	0.5	5 (max)	50	50	12	12
Industrial BI-FET Op Amp (Note 1)						
LF155	5	5	100	50	5	20
LF256	5	5	100	50	12	12
LF257	5	5	100	50	50	12
Commercial BI-FET and BI-FET II Op Amp (Note 3)						
LF351	10	10	200	25	13	16
LF351A	2	10	100	25	13	16
LF351B	5	10	200	25	13	16
LF355	10	5	200	25	5	25
LF355A	2	5 (max)	50	25	5	25
LF355B	5	5	100	50	5	20
LF356	10	5	200	25	12	15

LFT355	0.5	5 (max)	100	50	15	12
LFT356	0.5	5 (max)	50	50	5	20
LF13741	15	10	50	50	12	12
			200	25	0.5	37
BI-FET II Dual Op Amps (Characteristics for Each Amplifier) (Note 3)						
LF353	10	10	200	25	13	16
LF353A	2	10	100	25	13	16
LF353B	5	10	200	25	13	16
BI-FET II Quad Op Amps (Characteristics for Each Amplifier) (Note 3)						
LF347	10	10	200	25	13	16
LF347A	2	10	100	25	13	16
LF347B	5	10	200	25	13	16

BI-FET is a trademarked term by National Semiconductor who invented the technology in 1974

Note 1: DC electrical characteristics are -55°C to +125°C for Military and -25°C to +85°C for Industrial unless otherwise noted. AC electrical characteristics are T_A = 25°C, typical specifications unless noted.

Note 2: f = 1000 Hz.

Note 3: DC electrical characterists are 0°C to +70°C unless otherwise noted. AC electrical characterists are T_A = 25°C, typical specifications unless noted.

SELECTION BY DESIGN PARAMETER

Max Input Offset Voltage (T_A = 25°C)

0.5 mV
LFT155/LFT156
LFT355/LFT356

2 mV
LF155A/LF355A
LF156A/LF356A
LF347A
LF351A
LF353A
LF357A

5 mV
LF155/LF156/LF157
LF255/LF256/LF257
LF347B
LF351B
LF353B
LF355B/356B/357B

10 mV
LF347
LF351
LF353
LF355/LF356/LF357

15 mV
LF13741

Max Input Bias Current (T_J = 25°C)

50 pA
LF155A/LF156A/LF157A
LF355A/LF356A/LF357A
LFT155/LFT156

100 pA
LF155/LF156/LF157
LF255/LF256/LF257
LF347A
LF351A
LF353A
LF355B/256B/357B

200 pA
LF347/LF347B
LF351/LF351B
LF353/LF353B
LF355/LF356/LF357
LF13741

Typ Equivalent Input Noise Voltage per $\sqrt{\text{Hz}}$, f = 1000 Hz, R_S = 100 Ω

12 nV or Less
LF156/LF156A
LF157/LF157A
LF256/LF257
LF356B/357B
LFT156/356

15 nV to 10 nV
LF155
LF155A
LFT155
LF255
LF347
LF347A
LF347B
LF351
LF351A
LF353
LF353A
LF353B
LF355B
LF356
LF356A
LF357
LF357A

25 nV to 37 nV
LF355
LF355A
LF13741

Typ Slew Rate

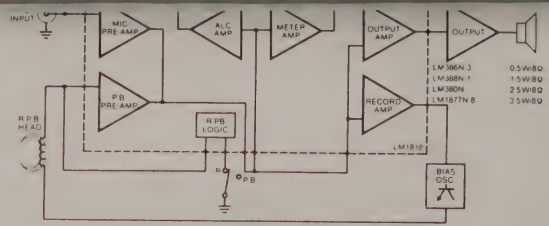
0.5 V/μs
LF13741

5 V/μs
LF155/LF155A
LFT155
LF255
LF355/LF355A
LFT355
LF355B

12 V/μs
LF156
LF156A
LFT156
LF256
LF256A
LF356
LF356A
LF356B
LFT356

13 V/μs
LF347
LF347A
LF347B
LF351
LF351A
LF351B
LF353
LF353A
LF353B

50 V/μs
LF157
LF157A
LF257
LF257A
LF357
LF357A
LF357B



ELECTRONIC SWITCHED TAPE AUDIO IC SYSTEM

KEY TECHNICAL SPECIFICATIONS

NSC Device Type	Features	Supply Voltage (V_{CC})	Supply Current (Max)	Amplifier Output Swing R_L = 10K	Signal to Noise	THD @ 1 kHz	ALC Attack Time	ALC Delay Time
LM1818	Electronic Play/Record Switching with simple contact DC logic control switch 50 dB Automatic level control range Separate R/RB amplifiers Low distortion 2 mA_{DC} meter output Supply decoupling by Internal Regulator Anti-Pop circuitry	3.5-18 V	6 mA	1 V_{RMS}	60 dB	0.1%	70 μs	30 sec

ELECTRONIC SWITCHED TAPE AUDIO IC SYSTEM (Continued)

IC PRODUCT SELECTION

Application	Cassette IC	P_o (Min)	V_{CC}	R_L @ 10% THD	NSC Audio Amplifier	Type Operation	Other Functions
Portable AM/FM Cassette	LM1818	250 mW	3 V	4 Ω	LM2001N	Mono	AM/FM Section TBA120S
		250 mW	6 V	8 Ω	LM386N-1	Mono	LM1820N
		500 mW	9 V	8 Ω	LM386N-3	Mono	Display Driver LM3914N LM3915N
		800 mW	6 V	4 Ω	LM390N	Mono	
		1.4 W	9 V	8 Ω	LM390N	Mono	
Cassette/ Home Stereo	LM1818	1.0 W	14 V	8 Ω	LM1877N-2	Stereo	FM-IF Section LM3089N Stereo Demod LM1800N Dolby Noise Reduction Cht LM1011N/AN
		1.5 W	16 V	8 Ω	LM1877N-5	Stereo	
		2.0 W	16 V	8 Ω	LM1877N-6	Stereo	
		3.5 W	18 V	8 Ω	LM1877N-8	Stereo	
		5.0 W	22 V	8 Ω	LM384N	Mono	
		30 W	±30	4 Ω	LM391N-60	Mono	
		60 W	±40	4 Ω	LM391N-80	Mono	
Tape Deck— High Fidelity	LM1818	—	—	—	Not required	Mono or Stereo	Audio Output LM1877 LM391N Dolby Noise Reduction LM1011N/AN
Office Dictating Machines	LM1818	250 mW	6 V	8 Ω	LM386N-1	Mono	Display Driver LM3914N LM3915N
Telephone Answering Machines		250 mW	6 V	8 Ω	LM389N	Mono	

AUDIO DRIVERS SYSTEM

KEY TECHNICAL SPECIFICATIONS[1]

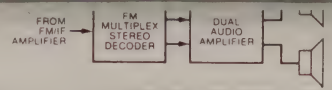
NSC Device Type	Features	Supply Voltage V_S	Total Supply Current	P_o(Min) THD = 10% P_o	V_{CC}	R_Z	IC Drive Current (Min)	Output Swing	Ripple Rejection (Min)	THD f = 1 kHz	Open Loop Gain f = 1 kHz	Driver PNP	Driver NPN	Output PNP	Output NPN
LM2000N	High Power Output	2.5-12 V	25 mA	1.0 W	9 V	8 Ω	100 mA	V_S-2V_{SAT}	40 dB	0.25%	65 dB			NSPR918	NSP4921
	Stable A-B Bias Current			2.0 W	9 V	4 Ω	100 mA								
	Adjustable Gain/ Bandwidth and Quiescent Current			4.0 W	9 V	2 Ω	100 mA								
				2.0 W	12 V	8 Ω	100 mA								
	Adjustable Drive Current			4.0 W	12 V	4 Ω	100 mA								
LM2001N	Battery Operation — Min 1.8 V	1.8-6 V	25 mA	200 mW	3 V	4 Ω	60 mA	V_S-2V_{SAT}	40 dB	0.25%	65 dB			92PU51	
	Stable A-B Bias Current			400 mW	3 V	2 Ω	60 mA								
	Adjustable Gain/ Bandwidth and Quiescent Current			500 mW	6 V	8 Ω	100 mA								
				1.0 W	6 V	4 Ω	100 mA								
	Low THD			1.7 W	6 V	2 Ω	100 mA								

AUDIO DRIVERS SYSTEM (Continued)

KEY TECHNICAL SPECIFICATIONS[1] (Continued)

NSC Device Type	Features	Supply Voltage V_S	Total Supply Current	P_o(Min) THD = 10% P_o	V_{CC}	R_Z	IC Drive Current (Min)	Output Swing	Ripple Rejection (Min)	THD f = 1 kHz	Open Loop Gain f = 1 kHz	Driver PNP	Driver NPN	Output PNP	Output NPN
LM391N-60	High Supply Voltage 0.01% THD 3 μV Input Noise	±30 V	ADJ	20 W	±23 V	8 Ω	5 mA	$V_S^+ - 7$ V	70 dB	0.01%	60 dB	BD-344	BD-345	BD-346	BD-347
	Dual Slope SOA Protection	±30 V	ADJ	30 W	±21 V	4 Ω	5 mA	$V_S^- + 7$ V	70 dB	0.01%	60 dB	BD-344	BD-345	BD-346	BD-347
LM391N-80	0.01% THD 90 dB Supply Rejection Shutdown Pin 3 μV Input Noise	±40 V	ADJ	40 W	±31 V	8 Ω	5 mA	$V_S^- - 7$ V	70 dB	0.01%	60 dB	BD-348	BD-349	BD-350	BD-351
		±40 V	ADJ	60 W	±27 V	4 Ω	5 mA	$V_S^- + 7$ V	70 dB	0.01%	60 dB	BD-348	BD-349	BD-350	BD-351

[1] Refer to technical data sheets for specific test conditions and other parametric data, including applications and recommended circuits.



MULTIPLEX STEREO DECODER SYSTEM

KEY TECHNICAL SPECIFICATIONS

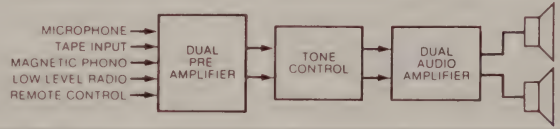
NSC Device Type	Features	Supply Voltage (V_{CC})	Supply Current	Stereo Lamp Hyteresis	Stereo Channel Serara.	Mono Channel Unbal.	Recovered Audio	THD (Max)	Capture Range	Dynamic Input Res.	Dynamic Output Res.
LM1800/LM1800A Phase Locked Loop FM Stereo Demodulator	Automatic stereo/ Monaural switching 45 dB supply rejection Low distortion: <0.1% Excellent channel separation Direct replacement for μA758 No coils; all tuning performed with single potentiometer	10-18 V	19 mA	6 dB	45 dB 100 Hz	0.3 dB	145 mVrms	1% max —A 0.3%	±4% of f_o	45k	1.3k
LM1310 Phase Locked Loop FM Stereo Demodulator	Automatic stereo/ monaural switching No coils; all tuning performed with single potentiometer Wide operating supply voltage range Excellent channel separation Direct replacement for MC1310	10-18 V	21 mA	6 dB	45 dB 1000 Hz	0.3 dB	195 mVrms	0.3%	±4% of f_o	45k	1.3k

FM/IF AMPLIFIERS AND DETECTOR SYSTEM

KEY TECHNICAL SPECIFICATIONS

NSC Device Type	Features	Supply Voltage (V_{CC})	Input Limiting Voltage	Maximum Useable Frequency	Output
LM3089 FM Receiver IF System	High sensitivity: 12 μV Low distortion: 0.1% Interchannel muting AFC, AGC outputs Direct replacement for CA3089E	8.5-16 V	12 μV	15 MHz	400 mV
SLM3075FM Detector/Limiter and Audio Preamplifier	Direct replacement for CA3075 Simple detector alignment: one coil Internal audio preamplifier Sensitivity: 3 dB limiting	8-12.5 V	250 μV	15 MHz	Audio 500 mVrms
LM703L Low Power Drain RF/OF Amplifier	Power consumption: 96 mW (max) Forwared transadmittance: 33 mmhos Input conductance: 0.35 mmhos Output conductance: 0.03 mmhos	7-20 V	–	–	–
LM1351 FM Detector, Limiter	Direct replacement for MC1351 High sensitivity: 3 dB limiting voltage 80 μV typical	4-15 V	300 μV	20 MHz	Audio 350 mVrms

Demodulator	FM, PM and frequency multiplication				
TBA120S IF Amplifier and Detector	Electronic Attenuator Sensitivity: 3 dB limiting Voltage 30 μV AM Rejection 68 dB at 10 mV	6-18 V	30 μV	5 MHz	D.C. Component 8 V



PREAMPLIFIER SYSTEM

KEY TECHNICAL SPECIFICATIONS

NSC Device Type	Features	Gain	Supply Voltage (V_{CC})	Supply Rejection	Output Voltage	THD	Gain Bandwidth Product
LM381/LM381A	Low noise: 0.5 μV total input noise High gain: 110 dB open loop Single supply operation Large output voltage swing (V_{CC}-2 V)p-p	112 dB	9-40 V	110 dB	(V_{CC}-2V)p-p	0.1%	15 MHz
LM382 Low Noise Dual Preamplifier with Equalization Resistors	Low noise: 0.8 μV total input noise High gain: 100 dB open loop Single supply operation Excellent channel separation: 60 dB	104 dB	9-40 V	110 dB	(V_{CC}-2V)p-p	0.1%	15 MHz
LM387/LM387A	Low noise: 0.65 μV total input noise High gain: 104 dB open loop Single supply operation Large output voltage swing (V_{CC}-2V)p-p	104 dB	9-40 V	110 dB	(V_{CC}-2V)p-p	0.1%	15 MHz

PREAMPLIFIER SYSTEM (Continued)

KEY TECHNICAL SPECIFICATIONS

NSC Device Type	Features	Gain	Supply Voltage (V_{CC})	Supply Rejection	Output Voltage	THD	Gain Bandwidth Product
LM1303	Direct replacement for μA739 Large output voltage swing: 4.0 Vrms min. High open-loop voltage gain: 80 dB Channel separation: 60 dB min @ 10 kHz	75 dB	9-30 V	–	4 Vrms	–	20 mHz

DUAL PREAMPLIFIER SELECTION

National Semiconductor's line of integrated circuits designed specifically to be used as audio preamplifiers consists of the LM381, LM382, LM387 and the LM1303. All are dual amplifiers in recognition of their major use in two channel applications. In addition there exists the LM389 which has three discrete NPN transistors that can be configured into a low noise monaural preamplifier for minimum parts count mono systems.

Bi-Fet Op Amps have low supply current and yet maintain a large gain bandwidth product with a fast slew rate. The matched high voltage JFET input devices provide very low input bias and offset current. These features are important characteristics for audio signal processing.

The following listed Bi-Fets are the more widely used devices for audio applications. Refer to 1978 Linear Data Book for other selections.

NSC Device Type	Features	V_{OS} Max Offset Voltage (mV) (T_A = 25°C)	I_B Max Bias Current (pA) (T_j = 25°C)	A_{VOL} Large Signal Voltage Gain (V/mV) Min (T_A = 26°C)	SR Slew Rate (V/s) Typ	e_n Equiv. Input Noise Voltage (nV/Hz)
LF351	Single Op Amp	10	200	25	13	15

TONE CONTROL AMPLIFIERS

KEY TECHNICAL SPECIFICATIONS

NSC Device Type	Features	Supply Voltage (V_{CC})	THD	Gain Bandwidth Product
LM387/LM387A Low Noise Dual Preamplifier	Low noise: 0.65 μV total input noise High gain: 104 dB open loop Single supply operation Large output voltage swing (V_{CC}-2V)p-p	9-40 V	0.1%	75 kHz
LM349 Quad Op Amp	Fast slew rate: 2V/μs No crossover distortion Low supply current: 0.6 mA/Amp 741 operating characters	±18 V	0.5%	20 kHz

TONE CONTROL AMPLIFIERS (Continued)

GENERAL PURPOSE OP-AMPS USEFUL FOR AUDIO

NSC Device[1] Type	Single	Dual	Quad	Compensated	Decompensated[2]	Uncompensated	Slew Rate[3] (V/μs)	Supply Voltage Typical (Min→Max)	Supply Current Maximum (mA)	General Features of Audio Application Interest
LM301A	X					X	5[4]	±3→±18	3	Low THD
LM324			X	X			0.3	3→30 (±1.5→±15)	2	Low supply current quad
LM343	X			X			2.5	±4→±34	5	High supply voltage
LM344	X					X	30	±4→±34	5	Fast LM343
LM347			X	X			13	±5→±18	12	High slew, low noise
LM349			X		X		2	±5→±18	4.5	Fast LM348
LM351	X			X			13	±5→±18	3.4	High slew, low noise
LM353		X		X			13	±5→±18	6.5	High slew, low noise
LF355	X			X			5	±5→±18	4	Low supply current LF356
LF356[5]	X			X			12	±5→±18	10	Fast, JFET input, low noise
LF357	X				X		50	±5→±18	10	Higher slew rate LF356
LM358		X					0.3	3→30 (±1.5→±15)	1.2	Dual LM324
LM394	–	–	–	–	–	–	–	–	–	Supermatch low noise transistor pair
LM3900			X	X			0.5	4→30 (±2→±15)	10	Quad current differencing amp
LM4250	X			X			0.03	±5→±18	0.1	Micropower

1. Commercial devices shown (0°C-70°C): extended temperature ranges available.
2. Decompensated devices stable above a minimum gain of 5V/V.
3. A_V = 1V/V unless otherwise specified.
4. Compensation capacitor = 3 pF: A_V = 10V/V minimum.
5. Highly recommended as general purpose audio building block.

IC SELECTION BY OUTPUT POWER VS. SUPPLY VOLTAGE AND LOAD IMPEDANCE

Load Impedance		2Ω	4Ω	8Ω	16Ω
Output Power[1]		P_o (Typical)	P_o (Typical)	P_o (Typical)	P_o (Typical)
V_{CC}	NSC Device Type				
3 V	LM2000/1	400 mW	250 mW	–	–
6 V	LM383	1.4 W	800 mW	440 mW	240 mW
	LM386, LM389	–	340 mW	320 mW	180 mW
	LM388	–	800 mW	600 mW	300 mW
	LM390	–	950 mW	650 mW	325 mW
	LM2000	2.0 W	1.0 W	–	–
9 V	LM383	3.5 W	2.1 W	1.2 W	630 mW
	LM386, LM389	–	380 mW	780 mW	500 mW
	LM388	–	1.8 W	1.3 W	650 mW
	LM390	–	2.0 W	1.4 W	700 mW
	LM2000	4.0 W	2.2 W	–	–
12 V	LM380	–	2.4 W	1.5 W	500 mW
	LM383	6.4 W	4.0 W	2.3 W	1.2 W
	LM386A, LM389	–	–	820 mW	950 mW
	LM388	–	2.4 W	2.2 W	1.3 W
14 V	LM380	–	3.3 W	2.2 W	1.0 W
	LM383	8.9 W	5.6 W	3.7 W	1.7 W
	LM386	–	–	–	1.3 W
	LM388	–	3.0 W	3.0 W	0.5 W
16 V	LM380	–	–	3.0 W	1.6 W
	LM386	–	–	–	1.6 W
	LM388	–	3.6 W	3.8 W	1.9 W
18 V	LM380	–	–	4.0 W	2.2 W
	LM383	–	9.6 W	5.5 W	2.9 W
	LM384	–	4.2 W	4.0 W	2.2 W
22 V	LM384	–	3.5 W	5.7 W	3.5 W
±22 V	LM391N-60	–	30 W	20 W	–
±30 V	LM391N-80	–	60 W	40 W	–

AUDIO POWER AMPLIFIER SYSTEM MONAURAL (SINGLE)

KEY TECHNICAL SPECIFICATIONS

NSC Device Type	Features	Applications	Ordering Number	P_o(Minimum) @ 10% THD P_o	V_{CC}	R_L	Supply Voltage (V_{CC})	Gain (A_v)V/V	Quiescent Current I_Q-TYP
LM386	Battery operation Low quiescent current Ground REF input 8-pin minidip	AM/FM radio amplifier Cassette amplifier Phono cartridge AMP Walkie-talkie	LM386N-1	250 mW	6 V	8 Ω	4 V-12 V	20-200	4 mA
			LM386N-3	500 mW	9 V	8 Ω	4 V-12 V	20-200	4.5 mA
			LM386N-4	700 mW	16 V	32 Ω	5 V-18 V	20-200	7 mA
LM389	Battery operation Low distortion Includes NPN (3) transistor array Freq (DC to 100 MHz)	Portable tape recorders Phono cartridge AMP Intercoms AM/FM radio Walkie-talkie	LM389N	250 mW	6 V	8 Ω	4 V-12 V	20-200	12 mA
LM388	Low voltage operation Variable voltage gain Excellent supply rejection 14-pin dip	AM/FM radio amplifiers Portable tape recorders Squelch circuits for FM scanners	LM388N-1	1500 mW	12 V	8 Ω	4 V-12 V	20-200	8 mA
			LM388N-2	800 mW	6 V	4 Ω	4 V-12 V	20-200	5 mA
			LM388N-3	2500 mW	16 V	8 Ω	5 V-18 V	20-200	15 mA
LM380	Ground referenced inputs Voltage gain fixed at 50 High input impedance Short circuit current (1.3A)	Phono amplifiers Cassette amplifiers	LM380N	2500 mW	18 V	8 Ω	8 V-22 V	50	10 mA
LM390	Ground referenced inputs Automatic bias at 1/2 Vcc	Bridge amplifiers Intercom	LM390N	800 mW	6 V	4 Ω	3.5 V-9 V	20-200	10 mA

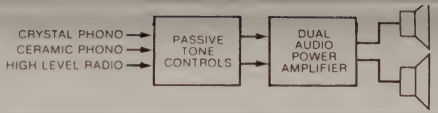
	High input impedance	8-track tape systems							
LM383	Short circuit protection Peak current (3.5A) Programmable gain Large output swing 5-pin to −220 package	Automotive audio AMP CB radio Bridge amplifiers	LM383T	4800 mW 7000 mW	14.4 V 14.4 V	4 Ω 2 Ω	5 V-20 V 5 V-20 V	50-500	45 mA
LM391	High V_{CC} (60-80 V) Low THD ⩽ 0.01% P_O = 40 W	Hi fidelity audio amplifiers Hi fidelity receivers	LM391N-80	40 W[1] 60 W[1]	±31 V ±27 V	8 Ω 4 Ω	±40 V ±40 V	20-200	–
LM2001	Battery operation min 1.8 V Adjustable gain/bandwidth Stable A-B bias	Battery operated audio systems	LM2001N	500 mW	6 V	8 Ω	1.8 V-6 V	–	–

Note: 1. P_O rated at specified conditions except THD 0.10%

AUDIO POWER AMPLIFIER SYSTEM MONAURAL (SINGLE) (Continued)

IC SELECTION BY OUTPUT POWER VS. SUPPLY VOLTAGE AND LOAD IMPEDANCE

R_L (Load Impedance)		8Ω	16 Ω
Output Power		P_o Typical	P_o Typical
V_S	NSC Device Type		
9 V	LM1877	0.5 W	
12 V	LM1877	1.2 W	–
	LM378	1.6 W	–
	LM379	1.6 W	–
14 V	LM1877N-2	1.8 W	–
	LM378	1.9 W	–
	LM379	1.9 W	–
16 V	LM1877N-6	–	–
	LM378	2.2 W	1.5 W
	LM379	2.2 W	1.5 W
18 V	LM1877N-8	3.5 W	–
	LM378	3 W	1.8 W
	LM379	3 W	1.8 W
20 V	LM1877N-10	4.0 W	–
	LM378	3.8 W	2.4 W
	LM379	3.8 W	2.4 W
22 V	LM1877	3.5 W	–
	LM378	4.6 W	2.8 W
	LM379	4.6 W	2.8 W
24 V	LM378	–	3.6 W
	LM379	5.4 W	3.6 W
26 V	LM378	–	4.2 W
	LM379	6.3 W	4.2 W
28 V	LM378	–	5 W
	LM379	7 W	5 W
30 V	LM379	–	5.5 W



AUDIO POWER AMPLIFIERS DUAL STEREO

KEY TECHNICAL SPECIFICATIONS

NSC Device Type	Features	Applications	Ordering Number	P_o (Minimum) V_S	R_L	P_o	Supply Voltage (V_S)	Quiescent Current (I_Q)	Channel Separation f = 1 kHz (output ref.)	Equiv Input Noise (^eN)	Open Loop Gain	Output Voltage Swing	Slew Rate V/μs
LM1877	Adjustable gain 50-250 High PSRR −68 dB Current limiting Thermal shutdown Low noise	Stereo phonograph Stereo tape recorders Bridge output stages Receivers	LM1877N-2[1] LM1877N-6[1] LM1877N-8[1] LM1877N-10[1]	14 V 16 V 18 V 20 V	8 Ω 8 Ω 8 Ω 8 Ω	1.0 W 2.0 W 3.5 W 4.0 W	6-20 V 6-26 V 6-26 V 6-26 V	25 mA 25 mA 25 mA 25 mA	70 dB 70 dB 70 dB 70 dB	2.5 μVrms 2.5 μVrms 2.5 μVrms 2.5 μVrms	90 dB 90 dB 90 dB 90 dB	10 V 10 V 12 V 14 V	2 2 2 2
LM378	A_{vo} typical 90 dB 3 MΩ input impedance Current limiting Thermal shutdown Internal stabilization	AM/FM stereo receivers Movie projectors Tape recorders Multi-channel audio systems	LM378N LM378N	24 V 30 V	8 Ω 16 Ω	4.0 W 4.0 W	10-35 V 10-35 V	15 mA 15 mA	70 dB 70 dB	3.0 μVrms 3.0 μVrms	90 dB 90 dB	16 V 16 V	14 14
LM379	Self centering bias Thermal shutdown Internal stabilization Current limiting	Multi-channel audio AM/FM radios Movie projectors Tape recorders/players	LM379S	28 V	8 Ω	6.0 W	10-35 V	15 mA	70 dB	3.0 μVrms	90 dB	18 V	14

Notes:
1. Refer to NSC data sheet LM1877 for additional standard selections.
2. For operation at ambient temperatures greater than 25°C the IC must be derated based on a maximum 150°C junction temperature using a thermal resistance obtained from device data sheet.
3. Output protection included on all devices.

VOLTAGE COMPARATOR GUIDE

Device	Temperature Range*	DTL/TTL Fanout	Supply Voltage Typ (V)	Input Bias Current (25°C) Max (μA)	Input Offset Current (25°C) Max (μA)	Input Offset Voltage (25°C) Max (mV)	Response Time† Typ (ns)	Voltage Gain Typ	Package Type	Comments
LM106	Military	10	V^+ = 12	20	3	2	40 max	40k	TO-5, F.P.	Single comparator with strobe, high speed and sensitivity, large fanout
LM206	Industrial	10	V^- = -3	20	3	2	40 max	40k	TO-5 F.P.	
LM306	Commercial	10	to -12	25	5	5	40 max	40k	TO-5 F.P.	
LF111	Military	2	36	0.05	0.000025	4	200	200k	TO-5 DIP F.P.	FET front-end inputs
LF211	Industrial	2	36	0.05	0.000025	4	200	200k	TO-5 DIP F.P.	
LF311	Commercial	2	36	0.15	0.000075	10	200	200k	TO-5 DIP F.P.	
LM111	Military	5	±15	0.1	0.04	0.7	200	200k	TO-5 DIP F.P.	Single, with strobe, will work from single supply, low bias current
LH2111 Dual(1)	Military	5	±15	0.1	0.04	0.7	200	200k	TO-5 DIP F.P.	
LM211	Industrial	5	to 5	0.1	0.04	0.7	200	200k	TO-5 DIP F.P.	
LM2211 Dual(1)	Industrial	5	to 5	0.1	0.04	0.7	200	200k	TO-5 DIP F.P.	
LM311	Commercial	5	and GND	0.25	0.06	2	200	200k	TO-5 DIP F.P.	
LH2311 Dual(1)	Commercial	5	and GND	0.25	0.06	2	200	200k	TO-5 DIP F.P.	
LM119	Military	2 (Each Side)	±15	0.5	0.075	4	80	40k	TO-5 DIP F.P.	High speed dual comparator
LM219	Industrial	2 (Each Side)	to 5	0.5	0.075	4	80	40k	TO-5 DIP F.P.	
LM319	Commercial	2 (Each Side)	and GND	1	0.2	8	80	40k	TO-5 DIP	
LM139 Quad	Military	1	±1	0.1	0.025	5	1.3 μs	200k	DIP F.P.	Quad comparator designed for single supply operation; input common mode range includes ground
LM239 Quad	Industrial	1	to +18	0.25	0.050	5	1.3 μs	200k	DIP	
LM339 Quad	Commercial	1	or from	0.25	0.050	5	1.3 μs	200k	DIP	
LM139A Quad	Military	1	2	0.1	0.025	2	1.3 μs	200k	DIP F.P.	Low offset voltage Quad comparator with DTL/TTL logic levels
LM239A Quad	Industrial	1	to 36	0.25	0.050	2	1.3 μs	200k	DIP	
LM339A Quad	Commercial	1	and GND	0.25	0.050	2	1.3 μs	200k	DIP	
LM160	Military	2	±4.5	10	2	2	16	3k	TO-5 DIP F.P.	Very high speed, outputs compatible with DTL/TTL logic levels
LM260	Industrial	2	to	10	2	2	16	3k	TO-5 DIP	
LM360	Commercial	2	±6.5	15	4	4	16	3k	TO-5 DIP	

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LM710	Military	1	V^+ = 12	20	3	2	40	1750	TO-5	Single, differential in, single output
LM710C	Commercial	1	V^- = -6	25	5	5	40	1500	TO-5 DIP	
LM711 Dual	Military	1	V^+ = 12	75	10	3.5	40	1500	TO-5	Dual differential, common output, individual strobes
LM711C Dual	Commercial	1	V^- = -6	100	15	5	40	1500	TO-5 DIP	
LM514 Dual	Military	1	V^+ = 14	20	3	3	30	1250	DIP	Dual LM710 with separate strobes, individual outputs
LM1414 Dual	Commercial	1	V^- = -7	25	5	4	30	1000	DIP	
LM2901 Quad	Industrial	1	±1 (2V) to ±18 (36)	0.25	0.05	7	1.3	200k	DIP	Quad comparator designed for single supply operation; input common-mode range includes ground

† Response time is specified for 100 mV step input with 5 mV overdrive.
(1) Dual version of device.
* Military: -55°C to +125°C; Industrial: -25°C to +85°C; Commercial: 0°C to +70°C.

VOLTAGE REFERENCE SELECTION GUIDE

Reverse Breakdown Voltage V_R @ I_R	Device	Voltage Tolerance Max, T_A = 25°C	Voltage Temperature Drift — ppm/°C Max or mV Max Change Over Temperature Range		Current Range I_R	Dynamic Impedance
			Drift (Max)	Temperature Range		
1.22	LM113	±5%	100 (typ)	–55°C to +125°C	500 μA to 20 mA	0.3 Ω
1.22	LM313	±5%	100 (typ)	0°C to +70°C	500 μA to 20 mA	0.3 Ω
1.22	LM113-1	±1%	50 (typ)	–55°C to +125°C	500 μA to 20 mA	0.3 Ω

VOLTAGE REFERENCE SELECTION GUIDE (Continued)

Reverse Breakdown Voltage V_R @ I_R	Device	Voltage Tolerance Max, T_A = 25°C	Voltage Temperature Drift — ppm/°C Max or mV Max Change Over Temperature Range		Current Range I_R	Dynamic Impedance
			Drift (Max)	Temperature Range		
1.22	LM113-2	±2%	50 (typ)	−55°C to +125°C	500 μA to 20 mA	0.3 Ω
1.23	LM185	±2%	50 (typ)	−55°C to +125°C	10 μA to 20 mA	0.3 Ω
2.49	LM136	±2%	18 mV	−55°C to +125°C	400 μA to 10 mA	0.2 Ω
2.49	LM136A	±1%	18 mV	−55°C to +125°C	400 μA to 10 mA	0.2 Ω
2.49	LM236	±2%	9 mV	−25°C to +85°C	400 μA to 10 mA	0.2 Ω
2.49	LM236A	±1%	9 mV	−25°C to +85°C	400 μA to 10 mA	0.2 Ω
2.49	LM336	±4%	6 mV	0°C to +70°C	400 μA to 10 mA	0.2 Ω
2.49	LM336B	±2%	6 mV	0°C to +70°C	400 μA to 10 mA	0.2 Ω
5.0	LM136-5.0	±2%	36 mV	−55°C to +125°C	400 μA to 10 mA	0.2 Ω
5.0	LM136A-5.0	±1%	36 mV	−55°C to +125°C	400 μA to 10 mA	0.2 Ω
5.0	LM236-5.0	±2%	18 mV	−25°C to +85°C	400 μA to 10 mA	0.2 Ω
5.0	LM236A-5.0	±1%	18 mV	−25°C to +85°C	400 μA to 10 mA	0.2 Ω
5.0	LM336-5.0	±4%	12 mV	0°C to +70°C	400 μA to 10 mA	0.2 Ω
5.0	LM336B-5.0	±2%	12 mV	0°C to +70°C	400 μA to 10 mA	0.2 Ω
6.90	LM129A	+3%, −2%	10	−55°C to +125°C	0.6 mA to 15 mA	0.6 Ω
6.90	LM129B	+3%, −2%	20	−55°C to +125°C	0.6 mA to 15 mA	0.6 Ω
6.90	LM129C	+3%, −2%	50	−55°C to +125°C	0.6 mA to 15 mA	0.6 Ω
6.90	LM329B	±5%	20	0°C to +70°C	0.6 mA to 15 mA	0.8 Ω
6.90	LM329C	±5%	50	0°C to +70°C	0.6 mA to 15 mA	0.8 Ω
6.90	LM329D	±5%	100	0°C to +70°C	0.6 mA to 15 mA	0.8 Ω
6.95	LM199A	+1%, −2%	0.5	−55°C to +85°C	0.5 mA to 10 mA	0.5 Ω
6.95	LM199A	+1%, −2%	10	85°C to +125°C	0.5 mA to 10 mA	0.5 Ω

6.95	LM399A	±5%	1	0°C to +70°C	0.5 mA to 10 mA	0.5 Ω
6.95	LM399	±5%	2	0°C to +70°C	0.5 mA to 10 mA	0.5 Ω
6.95	LM3999	±5%	5	0°C to +70°C	0.6 mA to 10 mA	0.6 Ω
10.00	LH0070-0	0.1%	20 mV	−25°C to +85°C	0 mA to 20 mA	0.2 Ω
10.00	LH0070-1	0.1%	10 mV	−25°C to +85°C	0 mA to 20 mA	0.2 Ω
10.00	LH0070-2	0.05%	4 mV	−25°C to +85°C	0 mA to 20 mA	0.2 Ω
10.24	LH0071-0	0.1%	20 mV	−25°C to +85°C	0 mA to 20 mA	0.2 Ω
10.24	LH0071-1	0.1%	10 mV	−25°C to +85°C	0 mA to 20 mA	0.2 Ω
10.24	LH0071-2	0.005%	4 mV	−25°C to +85°C	0 mA to 20 mA	0.2 Ω

LOW CURRENT ZENER DIODES

1.8 2.0 2.2 2.4 2.7 3.0 3.3 3.6 3.9 4.3 4.7 5.1 5.6	LM103	±10%	−5 mV/°C (typ)	−55°C to +125°C	10 μA to 10 mA	15 Ω

CROSS REFERENCING

2.5 VOLT REFERENCES

Part Number	NSC Equivalent
AD580J	LM336
AD580K	LM336
AD580S	LM136
MC1403	LM336
MC1503	LM136

5.0 VOLT REFERENCES

Part Number	NSC Equivalent
REF02	LM136-5.0
REF02C	LM336-5.0

6 VOLT REFERENCES

Zener Type	NSC Equivalent
1N429	LM129C/LM329D
1N821	LM129C/LM329D
1N823	LM129C/LM329C
1N825	LM129B/LM329B

6 VOLT REFERENCES

Zener Type	NSC Equivalent
1N827	LM129A
1N829	LM199/LM299
1N821A	LM129C/LM329D
1N823A	LM129C/LM329C
1N825A	LM129B/LM329B
1N827A	LM129A
1N829A	LM199/LM399
1N957	LM129C/LM329D
1N1735	LM129C/LM329D
1N4565	LM329D
1N4566	LM329C
1N4567	LM329B
1N4568	LM129A
1N4569	LM399
1N4565A	LM129C
1N4566A	LM129C
1N4567A	LM129B
1N4568A	LM129A
1N4569A	LM199

6 VOLT REFERENCES

Zener Type	NSC Equivalent
1N4570	LM329D
1N4571	LM329C
1N4572	LM329B
1N4573	LM129A
1N4574	LM399
1N4570A	LM129C
1N4571A	LM129C
1N4572A	LM129B
1N4573A	LM129A
1N4574A	LM199
1N4575	LM329D
1N4576	LM329C
1N4577	LM329B
1N4578	LM129A
1N4579	LM199
1N4575A	LM129C
1N4576A	LM129C
1N4577A	LM129B
1N4578A	LM129A

6 VOLT REFERENCES

Zener Type	NSC Equivalent
1N4579A	LM199
1N4580	LM329D
1N4581	LM329C
1N4582	LM329B
1N4583	LM129A
1N4584	LM199
1N4580A	LM129C
1N4581A	LM129C
1N4582A	LM129C
1N4583A	LM129B
1N4584A	LM129A

10 VOLT REFERENCES

Part Number	NSC Equivalent
AD2700	LH0070
REF01	LH0070

REFERENCES FOR A/D CONVERTERS

The accuracy of any converter is limited by the temperature drift or long term drift of the voltage reference, even if conversion linearity is perfect. Assuming that the voltage reference is allowed to add 1/2 least significant bit error (LSB) to the converter, it is surprising how good the reference must be when even small temperature excursions are considered. When temperature changes are large, the reference design is a major problem. Table I shows the reference requirements for different converters while Table II shows how the same problems exist with digital panel meters. Table III shows the range of temperature coefficient errors for different components used to make a 10V reference from a 6.9V zener.

TABLE I. Maximum Allowable Reference Drift for 1/2 Least Significant Bits Error of Binary Coded Converter

Temp Change	Bits					
	6	8	10	12	14	
25°C	310	80	20	5	1.25	ppm/°C
50°C	160	40	10	2.5	0.6	ppm/°C
100°C	80	20	5	1.2	0.3	ppm/°C
125°C	63	16	3	1	0.2	ppm/°C

TABLE II. Maximum Allowable Reference Drift for 1/2 Digit Error Digital Meters

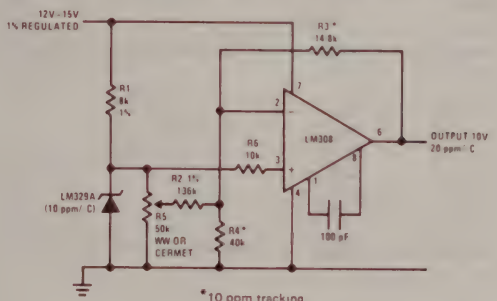
Temp Change	Digits								
	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	
25°C	200	100	20	10	2	1	0.2	0.1	ppm/°C
5°C			100	50	10	5	1	0.5	ppm/°C

TABLE III. Drift Error Contribution from Reference Components for a 10V Reference

Device	Error	10V Output Drift
Zener	Zener Drift	
LM199A	0.5 ppm/°C	0.5 ppm/°C
LM199, LM399A	1 ppm/°C	1 ppm/°C
LM399	2 ppm/°C	2 ppm/°C
1N829, LM3999	5 ppm/°C	5 ppm/°C
LM129, 1N823A, 1N827A, LM329A	10-50 ppm/°C	10-50 ppm/°C
LM329, 1N821, 1N825	20-100 ppm/°C	20-100 ppm/°C
Op Amp	Offset Voltage Drift	
LM725, LH0044, LM121	1 μV/°C	0.15 ppm/°C
LM108A, LM208A, LM308A	5 μV/°C	0.7 ppm/°C
LM741, LM101A	15 μV/°C	2 ppm/°C
LM741C, LM301A, LM308	30 μV/°C	4 ppm/°C
Resistors	Resistance Ratio Drift	
1% (RN55D)	50-100 ppm/°C	20-40 ppm/°C
0.1% (Wirewound)	5-10 ppm/°C	2-4 ppm/°C
Tracing 1 ppm Film or Wirewound	— —	0.4 ppm/°C

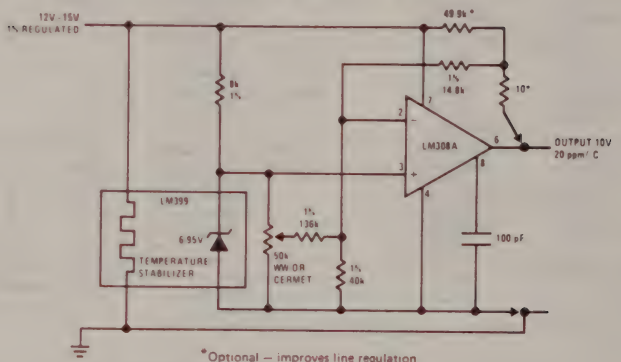
TYPICAL REFERENCE CIRCUITS

10V, 20 ppm Reference Using a Low Cost Zener and Low Drift Resistors



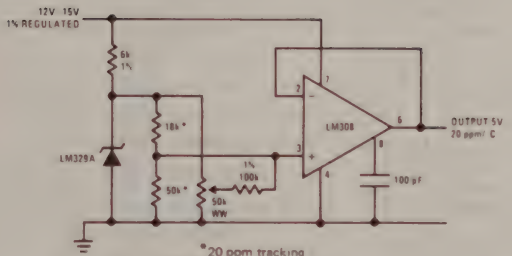
*10 ppm tracking

10V Reference has Low Drift Reference and Standard 1% Resistors.
Kelvin Sensing is Shown with Compensation for Line Changes.

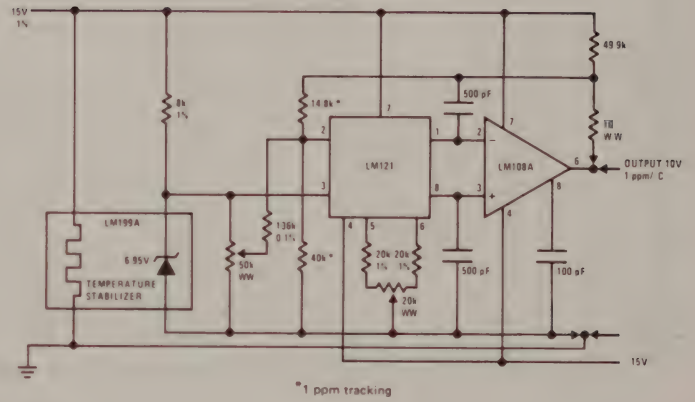


*Optional — improves line regulation

Low Voltage Reference



Ultra Low Drift Reference



APPLICATION LITERATURE NUMERICAL LISTING

AN-56 1.2V Reference
AN-161 I.C. Voltage Reference has 1 ppm per Degree Drift
AN-173 I.C. Zener Eases Reference Design
AN-184 References for A/D Converters

3-TERMINAL REGULATOR SELECTION GUIDE

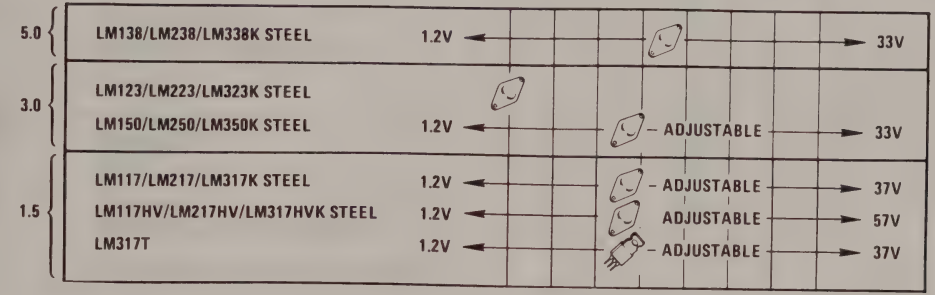
3-TERMINAL POSITIVE VOLTAGE REGULATORS

Output Current (A)	Device	Available V_{OUT}* (V)	V_{OUT} Tol. (±%)	Regulation		V_{IN} (V) Max	Ripple Rejection (dB)
				Line (Note 1) % V_{OUT}/V_{IN}	Load (Note 2) % V_{OUT}		
5	LM128, LM238	1.2 to 32 (Adjustable)	N/A	0.005	0.1	35	86
	LM338	1.2 to 32 (Adjustable)	N/A	0.005	0.1	35	86
3	LM150, LM250	1.2 to 32 (Adjustable)	N/A	0.005	0.1	35	86
	LM350	1.2 to 32 (Adjustable)	N/A	0.005	0.1	35	86
	LM123K, LM223K	5	6	0.01	0.5	20	75
	LM323K	5	4	0.01	0.5	20	75
1.5	LM117, LM217	1.2 to 37 (Adjustable)	N/A	0.01	0.1	40	80
	LM317	1.2 to 37 (Adjustable	N/A	0.01	0.1	40	80
	LM117HV, LM217HV	1.2 to 57 (Adjustable)	N/A	0.01	0.1	60	80
	LM317HV	1.2 to 57 (Adjustable)	N/A	0.01	0.1	60	80
	LM109K, LM209K	5	6	0.004	1.0	35	80
	LM309K	5	4	0.004	1.0	35	80
	LM140K	5, 12, 15	4	0.02	0.5	35, 40 (24V)	66-80
	LM140AK	5, 12, 15	2	0.002	0.1	35, 40 (24V)	66-80
	LM340	5, 12, 15	4	0.02	0.5	35, 40 (24V)	66-80
	LM340A	5, 12, 15	2	0.002	0.1	35, 40 (24V)	66-80
	LM78XXC	5, 12, 15	4	0.03	0.5	35, 40 (24V)	66-80
0.5	LM117H, LM217H	1.2 to 37 (Adjustable)	N/A	0.01	0.1	40	80
	LM317H	1.2 to 37 (Adjustable)	N/A	0.01	0.1	40	80
	LM117HVH, LM217HVH	1.2 to 37 (Adjustable)	N/A	0.01	0.1	40	80
	LM317HVH	1.2 to 37 (Adjustable)	N/A	0.01	0.1	40	80
	LM317M	1.2 to 37 (Adjustable)	N/A	0.01	0.1	40	80
	LM341	5, 12, 15	4	0.02	0.5	35, 40 (24V)	
	LM78MXX	5, 12, 15	4	0.03	0.5	35, 40 (24V)	
0.25	LM342	5, 12, 15	4	0.03	0.5	35, 40 (24V)	53-64

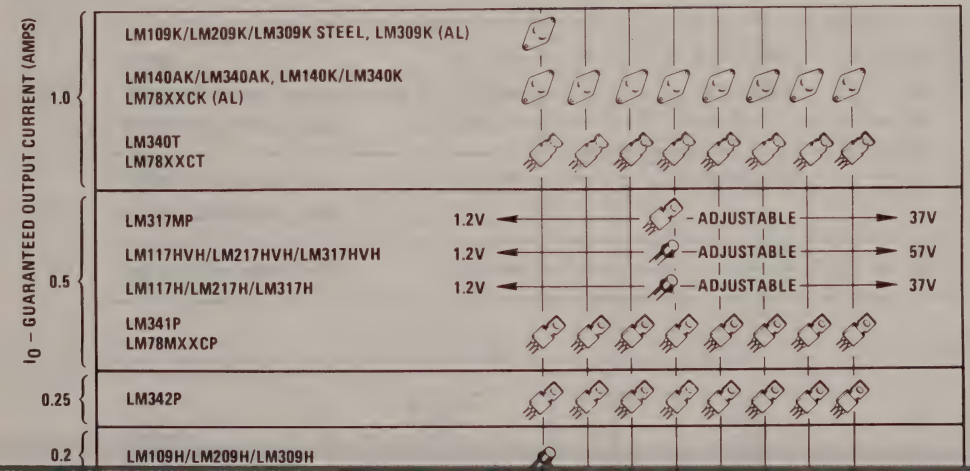
	LM330H, LM330P	5	4	0.02	0.3	26	56
	LM2930	5, 8	6	0.02	0.3	26	56
0.10	LM140L, LM340L	5, 12, 15	2	0.02	0.25	35, 40 (24V)	48-62
	LM78LXXA	5, 12, 15	4	0.03	0.25	35, 40 (24V)	45-60

*For voltages not shown, Adjustable Regulators are recommended.

Note 1: Line regulation is the chnage in output voltage for a change in input voltage. **Note 2:** Load regulation is the change in output voltage due to a change in load current from no load to full load.

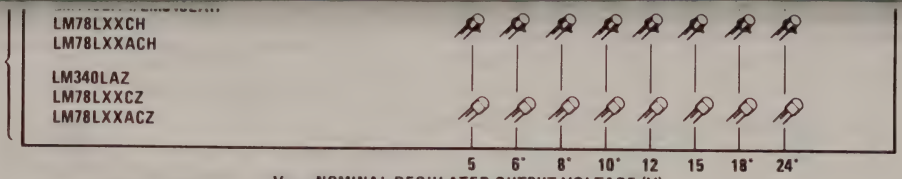


3-TERMINAL POSITIVE VOLTAGE REGULATORS (Continued)



	PACKAGE DESIGNATOR	PACKAGE TYPE
	K KC K STEEL	TO-3* HERMETIC
	T	TO-220 PLASTIC
	P	TO-202 PLASTIC
	H	TO-5, TO-39 HERMETIC
	Z	TO-92 PLASTIC

*All devices with TO-3 package designators (K or K STEEL) are supplied in steel TO-3 packages unless otherwise designated as (AL) aluminum TO-3 package. All KC designated devices are supplied in aluminum TO-3.



*Adjustable Voltage Regulators (LM317, LM350) are recommended when these voltages are required.

3-TERMINAL NEGATIVE VOLTAGE REGULATORS

Output Current (A)	Device	Available V_{OUT}* (V)	V_{OUT} Tol. (±%)	Regulation		V_{IN} (V) Max	Ripple Rejection (dB)
				Line (Note 1) % V_{OUT}/V_{IN}	Load (Note 2) % V_{OUT}		
3	LM145K, LM245K	−5.0	2	0.008	0.6	20	68
	LM345K	−5.0	4	0.008	0.6	20	68
1.5	LM137, LM237	−1.2 to −37 (Adjustable)	N/A	0.006	0.3	40	77
	LM337	−1.2 to −37 (Adjustable)	N/A	0.007	0.3	40	77
	LM137HV, LM237HV	−1.2 to −47 (Adjustable)	N/A	0.006	0.3	50	77
	LM337HV	−1.2 to −47 (Adjustable)	N/A	0.007	0.3	50	77
	LM120K	−5, −12, −15	2	0.02	0.3	25	64
						35 (9V, 12V)	80
						40 (15V, 18V)	75
						42 (24V)	70
	LM320K	−5, −12, −15	4	0.02	0.3	25	64
						35 (9V, 12V)	80
						40 (15V, 18V)	75

3-TERMINAL NEGATIVE VOLTAGE REGULATORS (Continued)

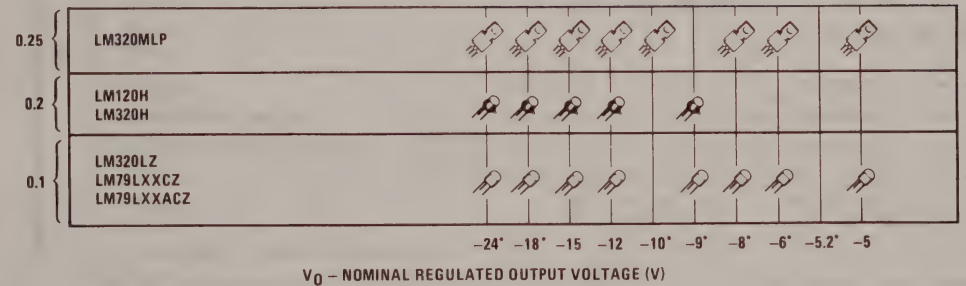
Output Current (A)	Device	Available V_{OUT}* (V)	V_{OUT} Tol. (±%)	Regulation		V_{IN} (V) Max	Ripple Rejection (dB)
				Line (Note 1) % V_{OUT}/V_{IN}	Load (Note 2) % V_{OUT}		
						42 (24V)	70
	LM320T	−5, −12, −15	4	0.02	0.3	25	64
						35 (9V, 12V, 15V, 18V)	75-80
						40 (24V)	70
	LM79XXC	−5, −12, −15	4	0.03	0.4	35, 40 (24V)	66-70
0.5	LM137H, LM237H	−1.2 to −37 (Adjustable)	N/A	0.006	0.3	40	77
	LM337H	−1.2 to −37 (Adjustable)	N/A	0.007	0.3	40	77
	LM137HVH, LM237HVH	−1.2 to −47 (Adjustable)	N/A	0.006	0.3	50	77
	LM337HVH	−1.2 to −47 (Adjustable)	N/A	0.007	0.3	50	77
	LM337M	−1.2 to −37 (Adjustable)	N/A	0.007	0.3	40	77
	LM120H	−5	2	0.02	0.6	25	64
	LM320H	−5	4	0.02	0.6	25	64
	LM320M	−5, −12, −15	4	0.02	0.6	25	60-64
						35 (9V, 12V, 15V, 18V)	70-80
						40 (24V)	
	LM79MXX	−5, −12, −15	4	0.03	0.7	35, 40 (24V)	58-60
0.25	LM320ML	−5, −12, −15	4	0.01	0.5	35, 40 (24V)	50-60
0.20	LM120H	−5, −12, −15	2	0.02	0.1	35 (9V, 12V)	70-80
	LM320H		4	0.02	0.1	40 (15V, 18V)	
						42 (24V)	
0.10	LM320L	−5, −12, −15	4	0.01	0.5	35, 40 (24V)	60-65
	LM79LXXA	−5, −12, −15	4	0.02	0.6	35, 40 (24V)	50-55

*For voltages not shown, Adjustable Regulators are recommended.

Note 1: Line regulation is the change in output voltage for a change in input voltage. **Note 2:** Load regulation is the change in output voltage due to a change in load current from no load to full load.

I_O – GUARANTEED OUTPUT CURRENT (AMPS)
1.5
1.0
0.5
LM137/LM237/LM337K STEEL
LM137HV/LM237HV/LM337HVK STEEL
LM337T
LM120K/LM320K, LM320KC, LM79XXCK(AL)
LM320T
LM79XXCT
LM137HVH/LM237HVH/LM337HVH
LM137H/LM237H/LM337H
LM337MP
LM120H
LM320H
LM320MP
LM79MXXCP
–37V
–47V
–37V
–37V
–47V
–37V
–37V
ADJUSTABLE
–1.2V

3-TERMINAL NEGATIVE VOLTAGE REGULATORS (Continued)



*The LM337 Adjustable Voltage Regulator is recommended when these voltages are required.

	PACKAGE DESIGNATOR	PACKAGE TYPE
	K KC K STEEL	TO-3* HERMETIC
	T	TO-220 PLASTIC
	P	TO-202 PLASTIC
	H	TO-5, TO-39 HERMETIC
	Z	TO-92 PLASTIC

*All devices with TO-3 package designators (K or K STEEL) are supplied in steel TO-3 packages unless otherwise designated as (AL) aluminum TO-3 package. All KC designated devices are supplied in aluminum TO-3.

Size	Pins	Output	National	AMD	FSC	Fujitsu	Harris	Hitachi	Intel	Intersil	Motorola	NEC	Synertek	TI	Misc
CMOS															
16 x 4	16	TS	MM74C89												
16 x 4	16	TS	MM74C989												
64 x 4	18	TS	MM74C910												
256 x 1	16	TS	MM74C200												
256 x 4	18	TS	MM74C921										5111		
256 x 4	22	TS	MM74C920				HM6551			IM6551C					**AMI**
1K x 1	16	TS	MM74C929				HM6508			IM6508		6508	5102	6508	S6508
1K x 1	18	TS	MM74C930				HM6518			IM6518					
TO BE ANNOUNCED															
256 x 4	18	TS	NMC6552												
256 x 4	22	TS	NMC6551				HM6551			IM6551					**AMI**
1K x 1	16	TS	NMC6508				HM6508			IM6508		6508			S6508
1K x 4	18	TS	NMC6514				HM6514	HM6147		IM6514		444/6514			
1K x 1	18	TS	NMC6518				HM6518			IM6518					
4K x 1	18	TS	NMC6504				HM6504			IM6504					
NMOS DYNAMIC															
4K x 1	22	TS	MM5280	9060E		MB8107H		HM4711-3	2107C-2		MCM6605	μPD411		TMS4060	**Mostek**
8K x 1	16	TS	MM5298						2109-2						MK4108

MOS MEMORY CROSS REFERENCE GUIDE (Continued)

Size	Pins	Output	National	AMD	FSC	Fujitsu	Harris	Hitachi	Intel	Intersil	Motorola	NEC	Synertek	TI	Misc
NMOS DYNAMIC															
16K x 1	16	TS	MM5290		F16K	MB8116H		HM4716A-2	2117-2		MCM4116	μPD416		TMS4116	MK4116 **Zilog** Z6116
TO BE ANNOUNCED															
16K x 1	16	TS	NMC5295						2118						
64K x 1	16	TS	NMC4164											4164	
NMOS STATIC															
256 x 1	16	TS	MM1101A	1101A					1101A						
1K x 1	16	TS	MM2102A	9102	2102H				2102A			MPD2102			
1K x 1	16	TS	MM2102AL	91L02	2102LH				2102AL						**Signetics**
1K x 4	18	TS	MM2114	9114E	2114	MD8114		HM472114A	2114	2114	MCM2114		SY2114	TMS4045	2614
1K x 4	18	TS	MM2114L	91L14E	2114L	MD8114EL			2114L	2114L	MCM21L14		SY2114L	TMS40L45	
4K x 1	18	TS	MM5257	4044							MCM6641			TMS4044	2613
4K x 1	18	TS	MM5257L	4244							MCM66L41			TMS40L44	
4K x 1	18	TS	MM2147	9147		MBM2147		HM4847	2147		MCM2147	μPD2147	2147		
4K x 1	18	TS	MM2147L	91L47					2147L			μPD2147L	2147L		
TO BE ANNOUNCED															

									2142				SY2142		
1K x 4	20	TS	MM2142AP	91L42					2142L				SY2142L		
4K x 1	18	TS	MM2141	4044-15					2141-3					TMS4245	
4K x 1	18	TS	MM2141P	4244-15					2141L-3						
EPROM															
256 x 8	24	TS	MM1702	AM1702					1702A						
256 x 8	24	TS	MM5203												
512 x 8	24	TS	MM5204												
512 x 8	24	TS	MM5204-1												
1K x 8	24	TS	MM2708	2708	F2708	MB8518H		HN462708	2708		MCM2708			TMS2708	
1K x 8	24	TS	MM2708-1												
1K x 8	24	TS	MM2758												**Mostek**
2K x 8	24	TS	MM2716	2716	2716	MBM2716		HN42716	2716		MCM2716L	μPD2716	SY2716	TMS2516	MK2716
TO BE ANNOUNCED															
4K x 8	24	TS	NMC2532											TMS2532	
4K x 8	24	TS	NMC2732						2732						
NMOS QUASI-STATIC — TO BE ANNOUNCED															
4K x 8			NMC6132												**Zilog** Z6132

BIPOLAR MEMORY CROSS REFERENCE GUIDE

Size	Pins	Output	National	AMD	Fairchild	Harris	Intel	Intersil	MMI	Motorola	Raytheon	Signetics	TI
Bipolar PROM													
32 x 8	16	OC	74S188 (IDM29750)	27S18 (29750A)		7602-5		5600	6330-1			82S23	74S188
32 x 8	16	TS	74S288 (IDM29751)	27S19 (29751A)		7603-5		5610	6331-1			82S123	74S288
256 x 4	16	OC	74S387 (IDM29760)	27S20 (29760A)	93417	7610-5		5603	6300-1		29662C	82S126	74S387
256 x 4	16	TS	74S287 (IDM29761)	27S21 (29761A)	93427	7611-5		5623	6301-1		29663C	82S129	74S287
512 x 4	16	OC	74S570	27S12	93436	7620-5		5604	6305-1	7620C	29610C	82S130	
512 x 4	16	TS	74S571	27S13	93446	7621-5		5624	6306	7621C	29611C	82S131	
512 x 8	20	OC	74S473	27S28					6348-1		29622C	82S146	74S473
512 x 8	20	TS	74S472	27S29					6349-1		29623C	82S147	74S472
512 x 8	24	OC	74S475 87S295	27S30	93438	7640-5	3604	5605	6340-1	7640C	29624	82S140	74S475
512 x 8	24	TS	74S474 (87S296)	27S31	93448	7641-5	3624	5625	6341-1	7641C	29625	82S141	74S474
1024 x 8	18	OC	74S572	27S32	93452	7642-5	3605A-1		6352-1	7642C		82S136	74S477
1024 x 4	18	TS	74S573	27S33	93453	7643-5	3625A-1		6353-1	7643C		82S137	74S476
2048 x 4	18	OC	87S184			7684					29650	82S184	

TO BE ANNOUNCED

32 x 8	16	OC	87S188										
32 x 8	16	TS	87S288										
1024 x 8	24	OC	87S180		93450	7680	3608		6380	7680	29630	82S180	74S479
1024 x 8	24	TS	87S181		93451	7681	3628		6381	7681	29631	82S181	74S478
2048 x 8	24	OC	87S190			76160-5						82S190	
2048 x 8	24	TS	87S191			76161-S	3636					82S191	

BIPOLAR PROM MILITARY DESIGNATOR 74SXXX = 54SXXX AND 87SXXX = 77SXXX

Bipolar RAM

16 x 4	16	OC	8589	3101	7489		3101	5501				8225	7489
16 x 4	16	TS	8599										
16 x 4	16	TS	74LS189	27LS03					L6561				
16 x 4	16	OC	74LS289	27LS02					L6560				
16 x 4	16	TS	74S189	27S03	93405			3101A	6561			74S189	74S189
16 x 4	16	OC	74S289	27S02	93404				6560			82S25	74S289
16 x 4	18	TS	85S68										
256 x 1	16	TS	74S200	27S00	93421			5523	6553			82S16	74S201
256 x 1	16	OC	74S206	27S01	93411			5503	6530			82S17	74S301

Size (Bits)	Organization	Part Number	Type	Operation	Maximum Supply Current	Maximum Access Time	Supply Voltage (V)	Temperature Range (°C)	In Production
65,536	65,536 x 1	NMC4164-2	NMOS	Dynamic	40 mA	150 ns	+5	0 to +70	
		NMC4164-3	NMOS	Dynamic	40 mA	200 ns	+5	0 to +70	
		NMC4164-4	NMOS	Dynamic	40 mA	250 ns	+5	0 to +70	
16,384	16,384 x 1	MM5290-2	NMOS	Dynamic	40 mA	150 ns	±5, +12	0 to +70	•
		MM5290-3	NMOS	Dynamic	40 mA	250 ns	±5, +12	0 to +70	•
		MM5290-4	NMOS	Dynamic	40 mA	250 ns	±5, +12	0 to +70	•
		NMC5295-2	NMOS	Dynamic	30 mA	150 ns	+5	0 to +70	
		NMC5295-3	NMOS	Dynamic	30 mA	200 ns	+5	0 to +70	
		NMC5295-4	NMOS	Dynamic	30 mA	250 ns	+5	0 to +70	
8192	8192 x 1	MM5298A-2	NMOS	Dynamic	40 mA	150 ns	±5, +12	0 to +70	•
		MM5298A-3	NMOS	Dynamic	40 mA	200 ns	±5, +12	0 to +70	•
		MM5298A-4	NMOS	Dynamic	40 mA	250 ns	±5, +12	0 to +70	•
		MM5298B-2	NMOS	Dynamic	40 mA	150 ns	±5, +12	0 to +70	•
		MM5298B-3	NMOS	Dynamic	40 mA	200 ns	±5, +12	0 to +70	•
		MM5298B-4	NMOS	Dynamic	40 mA	250 ns	±5, +12	0 to +70	•
4096	1024 x 4	MM2114	NMOS	Static	90 mA	450 ns	5	0 to +70	•
		MM2114A-2	NMOS	Static	70 mA	120 ns	+5	0 to +70	
		MM2114A-3	NMOS	Static	70 mA	150 ns	+5	0 to +70	
		MM2114A-4	NMOS	Static	55 mA	200 ns	+5	0 to +70	
		MM2114A-5	NMOS	Static	55 mA	250 ns	+5	0 to +70	
		MM2114L	NMOS	Static	65 mA	450 ns	5	0 to +70	•
		MM2114-2	NMOS	Static	90 mA	200 ns	5	0 to +70	•
		MM2114-2L	NMOS	Static	65 mA	200 ns	5	0 to +70	•

RAM SELECTION GUIDE (Continued)

Size (Bits)	Organization	Part Number	Type	Operation	Maximum Supply Current	Maximum Access Time	Supply Voltage (V)	Temperature Range (°C)	In Production
		MM2114-3	NMOS	Static	90 mA	300 ns	5	0 to +70	•
		MM2114-3L	NMOS	Static	65 mA	300 ns	5	0 to +70	•
		MM2142	NMOS	Static	55 mA	450 ns	+5	0 to +70	
		MM2142-2	NMOS	Static	55 mA	200 ns	+5	0 to +70	
		MM2142-3	NMOS	Static	55 mA	300 ns	+5	0 to +70	
		NMC6514	CMOS	Static	7 mA	250 ns	5	0 to +70	
	4096 x 1	MM2141-2	NMOS	Static	70 mA	120 ns	+5	0 to +70	
		MM2141-3	NMOS	Static	70 mA	150 ns	+5	0 to +70	
		MM2141-4	NMOS	Static	55 mA	200 ns	+5	0 to +70	
		MM2141-5	NMOS	Static	55 mA	250 ns	+5	0 to +70	
		MM2147	NMOS	Static	140 mA	70 ns	5	0 to +70	•
		MM5257	NMOS	Static	90 mA	450 ns	5	0 to +70	•
		MM5257-L	NMOS	Static	65 mA	450 ns	5	0 to +70	•
		MM5257-2	NMOS	Static	90 mA	200 ns	5	0 to +70	•
		MM5257-2L	NMOS	Static	65 mA	200 ns	5	0 to +70	•
		MM5257-3	NMOS	Static	90 mA	300 ns	5	0 to +70	•
		MM5257-3L	NMOS	Static	65 mA	300 ns	5	0 to +70	•
		NMC6504	CMOS	Static	7 mA	250 ns	5	0 to +70	
		MM4280	NMOS	Dynamic	60 mA	270 ns	±5, +12	−55 to +85	•
		MM5280	NMOS	Dynamic	60 mA	200 ns	±5, +12	0 to +70	•
		MM5280-5	NMOS	Dynamic	60 mA	270 ns	±5, +12	0 to +70	•
		MM5280-055	NMOS	Dynamic	60 mA	270 ns	±5, +12	0 to +55	•

		MMC54C930	CMOS	Static	4 mA	265 ns	5	−55 to +125	•
		MM74C930	CMOS	Static	4 mA	240 ns	5	−40 to +85	•
		MM74C930-3	CMOS	Static	4 mA	315 ns	5	0 to +70	•
		NMC6518	CMOS	Static	4 mA	250 ns	5	−40 to +85	•
	256 x 4	MM54C920	CMOS	Static	4 mA	275 ns	5	−55 to +125	•
		MM74C920	CMOS	Static	4 mA	250 ns	5	−40 to +85	•
		MM74C920-3	CMOS	Static	3 mA	325 ns	5	0 to +70	•
		NMC6551	CMOS	Static	4 mA	250 ns	5	−40 to +85	•
		NMC6552	CMOS	Static	4 mA	250 ns	5	−40 to +85	•
		MM54C921	CMOS	Static	4 mA	275 ns	5	−55 to +125	•
		MM74C921	CMOS	Static	4 mA	250 ns	5	−40 to +85	•
		MM74C921-3	CMOS	Static	3 mA	325 ns	5	0 to +70	•
	1024 x 1	DM10415	ECL	Static	150 mA	12 ns	−5.2	0 to +75	•
		DM10415A	ECL	Static	150 mA	35 ns	−5.2	0 to +75	•
		MM2102A	NMOS	Static	50 mA	350 ns	5	0 to +70	•
		MM2102A-L	NMOS	Static	33 mA	350 ns	5	0 to +70	•
		MM2102A-2	NMOS	Static	50 mA	250 ns	5	0 to +70	•
		MM2102A-2L	NMOS	Static	33 mA	250 ns	5	0 to +70	•
		MM2102A-4	NMOS	Static	50 mA	450 ns	5	0 to +70	•
		MM2102A-4L	NMOS	Static	33 mA	450 ns	5	0 to +70	•
		MM2102A-6	NMOS	Static	50 mA	650 ns	5	0 to +70	•
		MM2102A-6L	NMOS	Static	33 mA	650 ns	5	0 to +70	•
256	256 x 1	DM54S200	TTL	Static	130 mA	70 ns	5	−55 to +125	•
		DM74S200	TTL	Static	130 mA	50 ns	5	0 to +70	•
		DM54S206	TTL	Static	130 mA	80 ns	5	−55 to +125	•
		DM74S206	TTL	Static	130 mA	60 ns	5	0 to +70	•

RAM SELECTION GUIDE (Continued)

Size (Bits)	Organization	Part Number	Type	Operation	Maximum Supply Current	Maximum Access Time	Supply Voltage (V)	Temperature Range (°C)	In Production
		DM10414	ECL	Static	150 mA	12 ns	−5.2	0 to +75	•
		MM1101A	PMOS	Static	25 mA	1.5 μs	5, −9	0 to +70	•
		MM1101A-1	PMOS	Static	25 mA	1 μs	5, −9	0 to +70	•
		MM1101A-2	PMOS	Static	25 mA	500 ns	5, −9	0 to +70	•
		MM54C200	CMOS	Static	600 μA	400 ns	3 to 15	−55 to +125	•
		MM74C200	CMOS	Static	600 μA	400 ns	3 to 15	−40 to +85	•
	64 x 4	MM54C910	CMOS	Static	5 mA	860 ns	5	−55 to +125	•
		MM74C910	CMOS	Static	4 mA	700 ns	5	−40 to +85	•
64	16 x 4	DM5489	TTL	Static	120 mA	80 ns	5	−55 to +125	•
		DM7489	TTL	Static	120 mA	60 ns	5	0 to +70	•
		DM54LS189	TTL	Static	29 mA	100 ns	5	−55 to +125	•
		DM74LS189	TTL	Static	29 mA	80 ns	5	0 to +70	•
		DM54S189	TTL	Static	110 mA	50 ns	5	−55 to +125	•
		DM74S189	TTL	Static	110 mA	35 ns	5	0 to +70	•
		DM54LS289	TTL	Static	29 mA	110 ns	5	−55 to +125	•
		DM74LS289	TTL	Static	29 mA	90 ns	5	0 to +70	•
		DM54S289	TTL	Static	105 mA	50 ns	5	−55 to +125	•
		DM74S289	TTL	Static	105 mA	35 ns	5	0 to +70	•
		DM85S68	TTL	Static	100 mA	40 ns	5	0 to +70	•
		DM7599	TTL	Static	120 mA	70 ns	5	−55 to +125	•
		DM8599	TTL	Static	120 mA	50 ns	5	0 to +70	•
		MM54C89	CMOS	Static	300 μA	280 ns	3 to 15	−55 to +1125	•

BIPOLAR PROM SELECTION GUIDE

Size (Bits)	Organization		Part Number	Maximum Address Access (t_{AA}) in ns	Maximum Supply Current (I_{CC}) in mA	Temperature Range	In Production
16,384	2k x 8	OC	DM77S190	100	185	−55°C to +125°C	
	2k x 8	OC	DM87S190	80	175	0°C to +70°C	
	2k x 8	TS	DM77S191	100	185	−55°C to +125°C	
	2k x 8	TS	DM87S191	80	175	0°C to +70°C	
8192	2k x 4	OC	DM77S184	75	140	−55°C to +125°C	•
	2k x 4	OC	DM87S184	60	140	0°C to +70°C	•
	2k x 4	TS	DM77S185	75	140	−55°C to +125°C	•
	2k x 4	TS	DM87S185	60	140	0°C to +70°C	•
8192	1k x 8	OC	DM77S180	90	160	−55°C to +125°C	
	1k x 8	OC	DM87S180	70	160	0°C to +70°C	
	1k x 8	TS	DM77S181	90	160	−55°C to +125°C	
	1k x 8	TS	DM87S181	70	160	0°C to +70°C	
4096	1k x 4	OC	DM54S572	75	140	−55°C to +125°C	•
	1k x 4	OC	DM74S572	60	140	0°C to +70°C	•
	1k x 4	TS	DM54S573	75	140	−55°C to +125°C	•
	1k x 4	TS	DM74S573	60	140	0°C to +70°C	•
4096	512 x 8	OC	DM54S473	75	155	−55°C to +125°C	•
	512 x 8	OC	DM74S473	60	155	0°C to +70°C	•
	512 x 8	TS	DM54S472	75	155	−55°C to +125°C	•
	512 x 8	TS	DM74S472	60	155	0°C to +70°C	•
4096	512 x 8	OC	DM54S475	75	170	−55°C to +125°C	•
	512 x 8	OC	DM74S475	65	170	0°C to +70°C	•
	512 x 8	TS	DM54S474	75	170	−55°C to +125°C	•
	512 x 8	TS	DM74S474	65	170	0°C to +70°C	•

BIPOLAR PROM SELECTION GUIDE (Continued)

Size (Bits)	Organization		Part Number	Maximum Address Access (t_{AA}) in ns	Maximum Supply Current (I_{CC}) in mA	Temperature Range	In Production
2048	512 x 4	OC	DM54S570	65	130	−55°C to +125°C	•
	512 x 4	OC	DM74S570	55	130	0°C to +70°C	•
	512 x 4	TS	DM54S571	65	130	−55°C to +125°C	•
	512 x 4	TS	DM74S571	55	130	0°C to +70°C	•
1024	256 x 4	OC	DM54S387	60	130	−55°C to +125°C	•
	256 x 4	OC	DM74S387	50	130	0°C to +70°C	•
	256 x 4	TS	DM54S287	60	130	−55°C to +125°C	•
	256 x 4	TS	DM74S287	50	130	0°C to +70°C	•
256	32 x 8	OC	DM54S188	45	110	−55°C to +125°C	•
	32 x 8	OC	DM74S188	35	110	0°C to +70°C	•
	32 x 8	TS	DM54S288	45	110	−55°C to +125°C	•
	32 x 8	TS	DM74S288	35	110	0°C to +70°C	•

ROM SELECTION GUIDE

MOS ROMs

Size (Bits)	Organization	Part Number −55°C to +125°C	Part Number 0°C to +70°C	Typical Access in ns	Power Supplies	Logic Spec. (Note 2)	In Production
65,536	8192 x 8		MM52164	300	+5	Positive	•
32,768	4096 x 8		MM52132	300	+5	Positive	•
16,384	2048 x 8	MM52116	MM52116 (MM2316E)	300	+5	Positive	•
4096	1024 x 4	MM4232	MM5232	1000	+5, −12	Positive	•
	512 x 8	MM4214	MM5214	800	+5, −12	Positive	•
	512 x 8	MM4232	MM5232	800	+5, −12	Positive	•

	512 x 4	MM4230	MM5230	500	±12	Positive	•
	512 x 4	MM4231	MM5231	640	+5, −12	Negative	•
	256 x 8	MM4213	MM5213	600	+5, −12	Positive	•
	256 x 8	MM4230	MM5230	500	±12	Negative	•
	256 x 8	MM4231	MM5231	640	+5, −12	Positive	•
1024	256 x 4	MM4220	MM5220	500	±12	Negative	•
	256 x 4	MM4221	MM5221	700	+5, −12	Negative	•
	128 x 8	MM4220	MM5220	500	±12	Negative	•
	128 x 8	MM4221	MM5221	700	+5, −12	Negative	•

CHARACTER GENERATORS

Part Number					
Basic Number	Alpha Designator	No. of Characters	Font	Scan	Type of Characters
MM52116	FDW	128	5 x 7	Horizontal	
MM52116	FDX	128	7 x 9	Horizontal	Standard ASCII Character Set
DM8678**	BWF	64	7 x 9	Horizontal	Upper Case Block
	BTK		7 x 9		Upper Case Script
	CAB		5 x 7		Upper Case Block
	CAD		7 x 9		Kata Kana
	CAE		7 x 9		Shifted Lower Case Block
	CAH		5 x 7		Shifted Lower Case Block
	CAS		7 x 9		IBM 3741 Selectric
MM5241	ABL	64	7 x 5	Vertical	ASCII-7 Graphic
MM5240	AA	64	5 x 7	Horizontal	ASCII-7 Graphic
	AE				ASCII-7 Lower Case Graphic with Control Symbols

CODE CONVERTERS

Part Number			
Basic Number*	Alpha Designator	Organization	Conversion
MM4232/MM5232	AEI AEJ AEK	512 x 8	Sine look up tables (These 3 may be combined to give varying resolution and accuracy)
MM4231/MM5231	RP	256 x 8	EBCDIC → ASCII-7
MM4230/MM5230	BO KP	256 x 8	Hollerith → ASCII-8 ASCII-7 → Selectric and Selectric → ASCII-7
MM4221/MM5221	TM	256 x 4	Baudot → ASCII-7 and ASCII-7 → Baudot
MM4220/MM5220	DF AE	128 x 8	Quick brown fox generator BCD → ASCII-7 and BCD → 5-bit Baudot ASCII-7 to Hollerith

Notes:

1. See NSC Memory Data Book for standard programs. All ROMs may be custom programmed.
2. Devices are electrically specified with the following logic definitions. Positive logic: a logic "1" is the most positive logic voltage level. Negative logic: a logic "1" is the most negative logic voltage level.

*Part numbers with a 4 prefix are for −55°C to +125°C temperature range and with a 5 prefix are for 0°C to +70°C temperature range.

**Bipolar (TTL) device performs system function of parallel to serial shifting character address latching, character spacing and character line spacing in 16-pin package with 5V operation at 16 MHz clock rate.

MOS EPROM SELECTION GUIDE

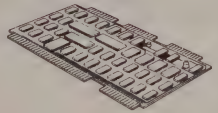
Size (Bits)	Organization	Part Number	Maximum Address Access (t_{AA})	Maximum Supply Current (I_{DD})	Temperature Range	In Production
32,768	4096 x 8	MM2732	450 ns	150 mA	0°C to +70°C	
16,384	2048 x 8	MM2716	450 ns	150 mA	0°C to +70°C	•
		MM2716M	450 ns	115 mA	−55°C to 125°C	•
8,192	1024 x 8	MM2708	450 ns	65 mA	0°C to +70°C	•
		MM2708-1	350 ns	65 mA	0°C to +70°C	•
		MM2708M	450 ns	65 mA	−55°C to 125°C	

[illegible]	[illegible]	MM4204	1.25 μs	52 mA	−55°C to +85°C	•
		MM5204	1.0 μs	42 mA	0°C to +70°C	•
		MM5204-1	0.7 μs	40 mA	0°C to +70°C	•
2048	512 x 4	MM4203	1 μs	55 mA	−55°C to +85°C	•
		MM5203	1 μs	55 mA	0°C to +70°C	•
	256 x 8	MM4203	1 μs	55 mA	−55°C to +85°C	•
		MM5203	1 μs	55 mA	0°C to +70°C	•
		MM1702A	1 μs	50 mA	0°C to +70°C	•

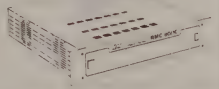
Development Systems

NSC Part Number	Intel Equiv. Part Number	Description	Availability
SPX-80/40	N/A	STARPLEX™ Development System with: Keyboard, Video Monitor, Dual Floppy Disc System (.5 megabyte) Complete Operating System Software, Utilities, Editor, Debugger, FORTRAN, BASIC and Thermal Printer	Now
SPX-80/41		STARPLEX Development System without Printer	Now
SPX-80/42		STARPLEX Development System with: The Impact Printer replacing the Thermal Printer	Now
SPX-80/51		STARPLEX Development System without Printer; with Double Density Storage (1 megabyte)	
SPX-80/61		STARPLEX Development System without Printer; with Double Density, Double-sided Storage (2 megabyte)	Jan
SPM-A08		In System Emulator Module with: Software, and RS232C Cable	Now
SPM-A09-1		8080 Emulator Package with: Target Board and Target Board Cable Assembly	Now
SPM-A09-2		8048 Emulator Package with: Target Board, Target Board Cable Assembly, and 8048 XASM	Jan
SPM-A10		Z80 Development Package includes Z80 XASM and ISE Card	Now
AEE-A001		STARLINK™ Comline for STARPLEX to MDS 220 and 230 Data Transfer with: RS232C 50 ft Cable and Associated Software	Now
AEE-A002		STARLINK Comline for STARPLEX to MDS 800/888 Data Transfer with: BLC-517 Board and Associated Software	Now
SPM-A50		Thermal Printer, 80 Character, 50 cps Line Printer	Now
SPM-A55		Impact Printer, 132 Character, 120 cps, Line Printer	Now

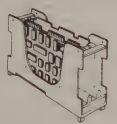
SERIES/80 MICROCOMPUTER FAMILY GUIDE (Continued)

			NSC Part Number	Intel Equiv. Part Number	Description	Availability
	Development Systems		SPM-A06-1		.5/1 megabyte Dual Floppy Disc Expansion Module	Now
			SPM-A06-2		2 megabyte Dual Floppy Disc Expansion Module	Jan
			SPM-A02-1		PROM Programmer Module for 2708 EPROMs	Now
			SPM-A02-2		PROM Programmer Module for 2716 EPROMs	Now
			SFW-A001-1C		8048 Cross Assembler	Now
	Boards	CPU	BLC-80/05	SBC-80/05	Board Level Computer w/512 Bytes RAM, 2708/2716/2732 EPROM Capability, Multimaster	Now
			BLC-80/07	N/A	Board Level Computer w/512 Bytes RAM, 2708 EPROM Capability	Now
			BLC-80/10	SCB-80/10	Board Level Computer w/1KB RAM, 2708 EPROM Capability	Now
			BLC-80/11	SBC-80/10A	Board Level Computer w/1KB RAM, 2708/2716 EPROM Capability	Now
			BLC-80/12	N/A	Board Level Computer w/2KB RAM, 2708/2716 EPROM Capability	Now
			BLC-80/14	N/A	Board Level Computer w/4KB RAM, 2708/2716 EPROM Capability	Now
			BLC-80/11T	N/A	Extended Temperature BLC-80/11 −40°C to +85°C	Now
			BLC-80/12T	N/A	Extended Temperature BLC-80/12 −40°C to +85°C	Now
			BLC-80/14T	N/A	Extended Temperature BLC-80/14 −40°C to +85°C	Now
			BLC-80/204	SBC-80/204	Board Level Computer w/4KB RAM, 2708/2716 EPROM Capability	Now
		Memory	BLC-016	SBC-016	16K RAM Board (fully populated)	Now
			BLC-8016	SBC-016	16K RAM Board (partially populated)	Now
			BLC-032	SBC-032	32K RAM Board	Now
			BLC-048	SBC-048	48K RAM Board	Now
			BLC-064	SBC-064	64K RAM Board	Now
			BLC-406	N/A	6KB ROM/PROM Board (MM1702)	Now
			BLC-416	SBC-416	16K ROM/PROM Board (MM2708)	Now
			BLC-8432	N/A	32K ROM/PROM Board with On-Board Programming (MM2716)	Now

Boards	I/O	BLC-501	SBC-501	Direct Memory Access Board	Now
		BLC-508	SBC-508	I/O Expansion, 4 8-Bit Input Ports, 4 8-Bit Output Ports	Now
		BLC-517	SBC-517	Combination I/O Expansion, 48 Programmable Parallel I/O Lines, 1 Serial I/O	Now
		BLC-530	SBC-530	Current Loop Adapter	Now
		BLC-8534	N/A	4-Channel Communications Board	Now
		BLC-8538	N/A	8-Channel Communications Board	Now
		BLC-556	SBC-556	Optically Isolated I/O Board	Now
	Peripheral Controllers	BLC-8201	N/A	Floppy Disc Controller (Intel Format)	Now
		BLC-8221	N/A	Floppy Disc Controller (IBM Format)	Now
		BLC-8222	N/A	Floppy Disc Controller (Double Density)	Now
		BLC-8228(E)*	N/A	Video Monitor/Keyboard Controller (5 by 7 Dot Matrix)	Now
		BLC-8229(E)*	N/A	Video Monitor/Keyboard Controller)7 by 9 Matrix)	Now
	Analog	BLC-711	SBC-711	Analog Input Board	Now
		BLC-724	SBC-724	Analog Output Board	Now
		BLC-732	SBC-732	Combination Analog I/O Board	Now
		BLC-8715	N/A	Intelligent I/O Board	Now
		BLC-8737	N/A	Analog I/O Board w/Memory	Now
Systems		BLC-80P	N/A	Prototyping Package with BLC-80/10 CPU	Now
		BLC-80P14	N/A	Prototyping Package with BLC-80/14 CPU	Now
		BLC-80P204	N/A	Prototyping Package with BLC-80/204 CPU	Now
		RMC-80/10	SYS-80/10	Rack Mount Computer System with BLC-80/10 CPU	Now
		RMC-80/14(E)	N/A	Rack Mount Computer System with BLC-80/14 CPU	Now
		RMC-80/204(E)	SYS-80/204	Rack Mount Computer System with BLC-80/204 CPU	Now
		RMC-660(E)	SBC-660	Rack Mount Computer System with Heavy Duty Power Supply (8 slots)	Now



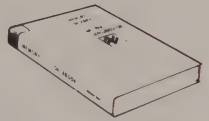
SERIES/80 MICROCOMPUTER FAMILY GUIDE (Continued)

		NSC Part Number	Intel Equiv. Part Number	Description	Availability
	Card Cages & Power Supplies	BLC-604	SBC-604	Card Cage with Backplane (4 slots)	Now
		BLC-614	SBC-614	Expansion Card Cage with Backplane (4 slots)	Now
		BLC-635(E)	SBC-635	System Power Supply (14A)	Now
		BLC-665(E)	SBC-640	Heavy Duty Power Supply (30A)	Now
	Accessories	BLC-610	MDS-610	Extender Board	Now
		BLC-8610	N/A	Extender Board, with Power Switching	Now
		BLC-901	SBC-901	220Ω/330Ω Terminator	Now
		BLC-902	SBC-902	1 kΩ Terminator	Now
		BLC-903	N/A	Option Jumper Kit	Now
		BLC-905	SBC-905	Universal Prototyping Card	Now
		BLC-8905	N/A	Universal Prototyping Card	Now
		BLC-955	SBC-955	Serial I/O Cable Set	Now
		BLC-956	SBC-956	Parallel I/O Cable Set	Now
		BLC-957	N/A	Power Supply Cable Set	Now
		BLC-8958	N/A	RMC Communications Conector Kit (6 inches)	Now
		BLC-8958-1	N/A	RETMA Communications Connector Kit (15 feet)	Now
		RMC-A001	N/A	RMC Communications Back Panel	Now
		AEE-001	N/A	RETMA Communications Terminal Panel	Now

Firmwa

BLC-920	N/A	Prototyping System Monitor — BLC-80P204	Now
BLC-8908	N/A	Prototyping System Monitor — BLC-80/05	Now
BLC-8915	N/A	Prototyping System Monitor — BLC-8715	Now

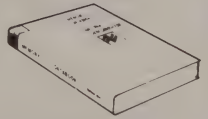
(E) A 230V, 50 Hz version of this product is also available.



Manuals

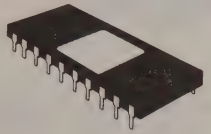
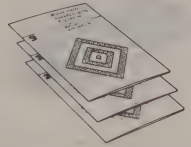
NSC Part Number	Description	Availability
420305375-001	BLC-016 User's Manual	Now
420305529-001	BLC-8016, 032, 048, 064 Hardware Reference Manual	Now
420305376-001	BLC-104,116,517 Hardware Reference Manual	Now
420305374-001	BLC-406 Hardware Reference Manual	Now
420305447-001	BLC-416/8432 User's Manual	Now
420305525-001	BLC-501 Hardware Reference Manual	Now
420305448-001	BLC-508 Hardware Reference Manual	Now
420305559-001	BLC-556 Hardware Reference Manual	Now
420305489-001	BLC-635 User's Manual	Now
420305561-001	RMC-660 User's Manual	Now
420305220-001	BLC-665 User's Manual	Now
420305649-001	BLC-711/732 Hardware Reference Manual	Now
420305647-001	BLC-724 Hardware Reference Manual	Now
420305890-001	BLC-8737 Hardware Reference Manual	Now
420305817-001	BLC-80/05 Hardware Reference Manual	Now
420305373-001	BLC-80/10 Hardware Reference Manual	Now
420305535-001	RMC-80/10 User's Manual	Now
420305506-001	RMC-80/10 Hardware Reference Manual (set of 3)	Now

SERIES/80 MICROCOMPUTER FAMILY GUIDE (Continued)

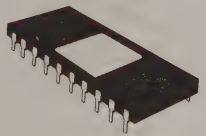


Manuals

NSC Part Number	Description	Availability
420305532-001	BLC-80/11, 12, 14 (T) Hardware Reference Manual	Now
420305620-001	RMC-80/14 User's Manual	Now
420305521-001	BLC-80/204 Hardware Reference Manual	Now
420305761-001	RMC-80/204 User's Manual	Now
420305883-001	RMC-80/204 System Package (set of 3)	Now
420305388-001	BLC-80P User's Manual	Now
420305618-001	BLC-80P14 User's Manual	Now
420305745-001	BLC-80P204 User's Manual	Now
420305586-001	BLC-8201/8221 Hardware Reference Manual	Now
420305804-001	BLC-8222 Hardware Reference Manual	Now
420305587-001	BLC-8228/8229 Hardware Reference Manual	Now
420305528-001	BLC-8534/8538 Hardware Reference Manual	Now
420306105-001	BLC-80/05 Monitor User's Manual	Now
420305546-001	STARPLEX™ Systems Reference Manual	Now
420305788-001	STARPLEX Software Reference Manual	Now
420305789-001	STARPLEX Macroassembler Software User's Manual	Now
420305790-001	STARPLEX FORTRAN Compiler Software User's Manual	Now
420305791-001	STARPLEX BASIC Interpreter Software User's Manual	Now
420305793-001	STARPLEX Hardware Maintenance Manual	Now
420306064-001	8048 Cross Assembler Manual	Now
420305869-001	ISE System Reference Manual	Now
420305653-001	ISE User's Manual	Now

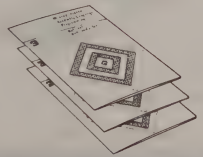
	New ■	Part Number	Description	Availability
	Chips	INS8060	N-Channel 8-Bit CPU	Now
		INS8154	128 x 8 RAM with 16 Programmable I/O Ports	Now
		INS8254	16-Bit Programmable I/O	Now
		INS8295	NIBL ROM, 2708 Pin Compatible	Now
	Literature		Product Data Sheets	Now
			SC/MP Assembly Language Programming Manual	Now
		420305239-001	SC/MP Applications Handbook	Now
		4200114	SC/MP PROM Programming User's Manual	Now
		4200115	SC/MP Firmware Paper Tape Generation Manual	Now
		420305398-001	SC/MP NIBL User's Manual	Now

4004 4-BIT MICROPROCESSOR FAMILY (FIPS)

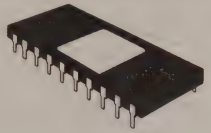


New ■	Part Number	Description	Availability
Chips	INS4001	256 x 8 ROM	Now
	INS4002	320-Bit RAM (SRC 0, 1)	Now
	INS4002-2	320-Bit RAM (SRC 3, 4)	Now
	INS4003	Shift Register	Now
	INS4004	4-Bit CPU	Now
	INS4008	Address Latch	Now
	INS4009	Multiplexer	Now
	INS4201	Clock	Now

48-SERIES MICROCOMPUTER/MICROPROCESSOR FAMILY

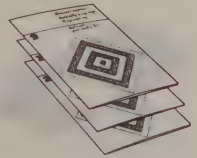


New ■	Part Number	Description	Availability
Literature ■		Product Data Sheets	Now



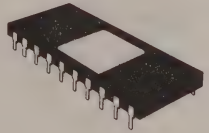
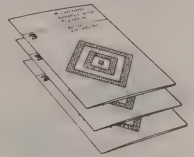
		1K x 8 ROM, 64 x 8 RAM	
Chips and Firmware	■	INS8049	N-Channel 8-Bit Microcomputer containing 27 I/O Lines, 1K x 8 ROM, 128 x 8 RAM — 4th Q, '79
	■	INS8050	N-Channel 8-Bit Microcomputer containing 27 I/O Lines, 4K x 8 ROM, 256 x 8 RAM — 1st Q, '80
	■	INS8035	ROMless version of INS8048 — 2nd Q, '80
	■	INS8039	ROMless version of INS8049 — 4th Q, '79
	■	INS8040	ROMless version of INS8050 — 1st Q, '80
	■	INS8243	Input/Output Expander — Now

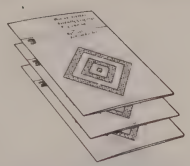
SUPPORT LITERATURE



Literature	■	48-Series Family Handbook	November

70-SERIES MICROPROCESSOR/MICROCOMPUTER FAMILY

		New ■	Part Number	Description	Availability
	Chips and Firmware	■	INS8070	N-Channel 8-Bit CPU containing 64 x 8 RAM	4th Q, '79
		■	INS8072	Version of INS8070 containing 2.5K ROM	4th Q, '79
		■	INS8073	8070 Family Member executing NIBL High-Level Language	4th Q, '79
	Literature	■		Product Data Sheets	Now

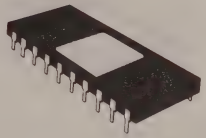


Literature

■

70-Series Microprocessor User's Manual — Now

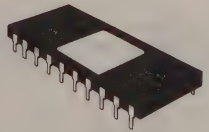
8080A 8-BIT MICROPROCESSOR FAMILY



Chips and Firmware

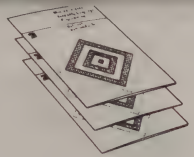
INS8080A	8-Bit CPU (2.0 μs)	Now
INS8080A-1/-2	8-Bit CPU (1.3 μs)	Now
INS8154	128 x 8 RAM with 16 Programmable I/O Ports	Now
INS8202	8-Bit Bus Driver	Now
INS8203	8-Bit Bus Driver (Inv.)	Now
INS82LS05	1 of 8 Decoder	Now
INS8208B	8-Bit Bidirectional Bus Driver	Now
INS8212	8-Bit I/O Port	Now
INS8216/26	4-Bit Bidirectional Bus Driver	Now
INS8224	8080 Clock Generator and Driver	Now
INS8228/38	8080 System Controller and Bus Driver	Now

8080A 8-Bit MICROPROCESSOR FAMILY (Continued)



Chips and Firmware

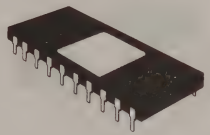
New ■	Part Number	Description	Availability
	INS8244	90 Key Keyboard Encoder	Now
	INS8245	16 Key Keyboard Encoder	Now
	INS8246	20 Key Keyboard Encoder	Now
	INS8247	4 Digit Display Controller	Now
	INS8248	6 Digit Display Controller	Now
	INS8250	Asynchronous Communications Element	Now
	INS8251	Programmable Communications Interface	Now
	INS8253	Programmable Interval Timer	Now
■	INS8253-5	High Speed Version of INS8253	Now
	INS8254	16-Bit Programmable I/O	Now
	INS8255	Programmable Peripheral Interface	Now
	INS8257B	Programmable DMA Controller	Now
	INS8259	Programmable Interrupt Controller	Now
■	INS8277	Advanced Video Interface Device	3rd Q, '80
	INS8285	Character Generator	Now
	INS8292	8-Bit A/D with 16 Channel Mux	Now
	INS1771-1	Floppy Disc	Now
	DP8350	Programmable CRT Controller	Now
	INS82891/93	Dual Density Floppy Disc Controller	3rd Q, '80



Literature

Series 8000 Microprocessor Family Handbook		Now

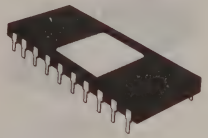
2900-BIT SLICE MICROPROCESSOR FAMILY*



Chips

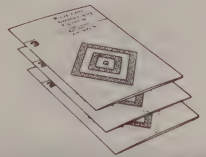
IDM2901A	4-Bit Slice Microprocessor		Now
IDM2901A-1	4-Bit Slice Microprocessor — Fast		Now
IDM2901A-2	4-Bit Slice Microprocessor — Very Fast	■	4th Q, '79
IDM2902	Look-Ahead Carry Generator		Now
IDM2903A	4-Bit Slice Microprocessor	■	1st Q, '80
IDM2909A	Microprogram Sequencer		Now
IDM2910A	Microprogram Sequencer 12-Bit	■	1st Q, '80
IDM2911A	Microprogram Sequencer		Now
IDM29110	Microprogram Sequencer — Double Pipeline	■	1st Q, '80
IDM29702	Open Collector 16 x 4 RAM		Now
IDM29703	TRI-STATE 16 x 4 RAM		Now
IDM29750	Open Collector 32 x 8 PROM		Now

2900-BIT SLICE MICROPROCESSOR FAMILY* (Continued)

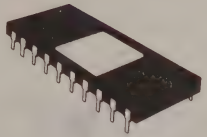


New ■	Part Number	Description	Availability
Chips	IDM29751	TRI-STATE 32 x 8 PROM	Now
	IDM29761	TRI-STATE 256 x 4 PROM	Now
	IDM29760	Open Collector 256 x 4 PROM	Now
	IDM29803	16-Way Branch Controller (for IDM2909A)	Now
	IDM29811	Next Address Controller (for IDM2911)	Now
	IDM29901	TRI-STATE Octal Register	Now
	IDM29902	Priority Encoder	Now
	IDM29903	16 x 4 Edge Triggered Register	Now
	IDM29908	Quad-Gated Flip-Flop	Now
	IDM29705/29705A	16 x 4 Dual Port RAM, Std/Fast	

*Full Military/883 Processing Available.

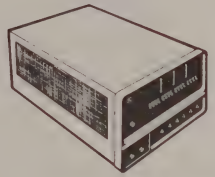


Literature		Product Data Sheets	Now
		2900 Family Data Book	Now
		AN203 Application Note	Now
		AN217 Application Note	Now
	■	AN230 Application Note	Now



Chips

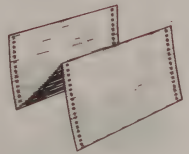
INS8900	16-Bit CPU	Now
INS8208	8-Bit Bi-Directional Bus Driver	Now
MM74C04	Hex Inverter (Clock Driver)	Now

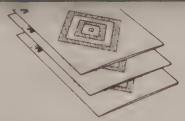


Systems

IPC-16P/UDS1	Universal Development System, 16K, Dual Drive DOS, CRT Terminal, Printer, BASIC, Macro Assembler for 8900, 8060, 8080	Now
IPC-16P/108H	Development System, 8K, and Heavy Duty Power Supply	Now
IPC-16P/116H	Development System, 16K, and Heavy Duty Power Supply	Now
(All above include complete resident system software — IPC-16S/901C)		
IPC-16P/004A	Universal Development System Static RAM Card (4K x 16)	Now
IPC-16P/008B	Universal Development System ROM/PROM Socket Card (8K x 16)	Now
IPC-16P/008P	Universal Development ROM/PROM Card (8K x 16)	Now
IPC-16P/100	IMP-16/PACE System Conversion Kit (CPU Card, PACE Software and Development System Firmware	Now
IPC-16P/805	PROM Programmer for Universal Development System	Now

INS8900* 16-BIT MICROPROCESSOR FAMILY (Continued)

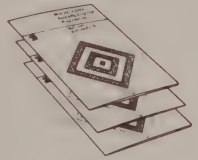
	New ■		Part Number	Description	Availability
	Systems		IPC-16P/813	Centronics Printer, Model 702	Now
			IPC-16P/840	Floppy Disc Operating System: Dual Floppy Disc Drive; Interface Card; ROM Resident Firmware Card; Software on Diskette (requires 16K of Memory)	Now
			IPC-16P/852	Paper Tape Reader (Plessy 1000 cps)	Now
			IPC-16P/842	Video Display Unit	Now
			IPC-16P/810	Teletypewriter ASR Model 33	Now
	Software		IPC-16S/901C	Resident System Software Package: Source Editor; 4K, 8K and Conversational Assemblers, Absolute and General Loaders; Hardware Diagnostics; plus DEBUG and Utility Software (Paper Tape)	Now
			IPC-16S/902M	Floppy Disc Operating Software Package on Diskette (copies)	Now
			IPC-16S/101C	IMP-16 Based Cross Assembler — 8K Memory required (Paper Tape)	Now
			IPS-16S/102P	FORTRAN IV Cross Assembler for 16-Bit or Larger Word Computers (Cards)	Now
			IPC-16S/201C	BASIC Interpreter — 8K Memory required (Paper Tape)	Now
				Product Data Sheets	Now
				8900 Brochure	Now



Literatur

IPC-16S/969Y	Assembly Language Programming Manual	Now
IPC-16S/201Y	PACE BASIC User's Manual	Now
IPC-16S/172Y	FORTRAN IV Cross Assembler Installation Manual	Now

SUPPORT LITERATURE



Literature

Microprocessor Training Brochure	Now
Microprocessors in Business, Science & Industry (Reprints)	Now

MICROPROCESSOR SUPPORT DEVICES

	New	Part Number	Description	Availability
Universal Interface		INS8202/03	TRI-STATE Octal Buffers	Now
		INS82LS05	1-of-8 Binary Decoder (functional equivalent to Intel's 8205)	Now
		INS8208B	Octal Bus Driver	Now
		INS8212	8-Bit I/O Port	Now
	■	INS8243	I/O Expander	Now
		INS8253	Programmable Timer	Now
	■	INS8253-5	High Speed 8253	Now
		INS8254	16-Bit Programmable I/O Peripheral Interface	Now
		INS8255	Programmable Peripheral Interface	Now
		INS8257B	Programmable DMA Controller	Now
		INS8259	Programmable Interrupt Controller	Now
Human Interface		INS8244	90-Key Keyboard Encoder	Now
		INS8245/46	16- and 20-Key Keyboard Encoders	Now
		INS8247	4 Digit Display Controller	Now
		INS8248	6 Digit Display Controller	Now
		INS8285	CRT Character Generator	Now
	■	INS8277	Advanced Video Interface Device	3rd Q. '80

Communications				
			INS1771-1	Floppy Disk Controller — Now
			INS8250	Asynchronous Communications Element (ACE) — Now
			INS8251	Programmable Communications Interface — Now

New product availabilities subject to change without notice; consult your National sales representative or distributor.

Product Number	Description	Process	Package		Comments
			Pins	Type	
	COUNTERS AND TIMERS				
MM5367	6 and 18 Stage Mask Programmable Oscillator-Divider	CMOS	8	N	Note 1
MM5367NES	3.58 MHz to 10 Hz and 275.35 Hz Oscillator-Divider	CMOS	8	N	
MM5368	32 kHz to 50 or 60 Hz plus 10 and 1 Hz Oscillator-Divider	CMOS	8	N	3-15 V Supply
MM5369	17 Stage Mask Programmable Oscillator-Divider	CMOS	8	N	Note 1
MM5369AA	3.58 MHz to 60 Hz Oscillator-Divider	CMOS	8	N	10 V Supply
MM5369EST	3.58 MHz to 100 Hz Oscillator-Divider	CMOS	8	N	10 V Supply
MM5369EYR	3.58 MHz to 50 Hz Oscillator-Divider	CMOS	8	N	10 V Supply
MM53107	17 Stage Mask Programmable Oscillator Divider	CMOS	8	N	Note 1
MM53107AA	2.09 MHz to 60 Hz Oscillator-Divider	CMOS	8	N	5 V Supply
MM53107FDU	3.58 MHz to 50 Hz Oscillator-Divider	CMOS	8	N	5 V Supply
MM5865	32.8 kHz Universal Timer	PMOS	40	N	7 Programmable Functions
	DATA COMMUNICATIONS				
MM5303	Universal Asynchronous Reciever Transmitter (UART)	PMOS	40	N	
MM5307	Baud Rate Generator-Mask Programmable	PMOS	14	D, N	Note 1
MM5307AA	Popular Standard Baud Rate Output Frequencies	PMOS	14	P, N	Note 2
MM5307AB	Popular Standard Baud Rate Output Frequencies	PMOS	14	D, N	Note 2
MM5307FAG	Popular Standard Baud Rate Output Frequencies	PMOS	14	D, N	Note 2
	A/D – ANALOG TO DIGITAL CONVERTER				
MM5330	4-1/2 Digit Panel Meter Block	PMOS	16	N, D	Also Called ADB4500PCN
MM5863	12-Bit Binary A/D Block	PMOS	28	N, D	Also Called ADB1200PCN
	DISPLAY DRIVERS				
MM5450	LED, 34-Segment Direct Drive, Serial Input	NMOS	40	D, N	
MM5451	LED, 35-Segment Direct Drive, Serial Input	NMOS	40	D, N	
	KEYBOARD ENCODERS				
MM5745	78 Key with N-Key/2-Key Rollover	PMOS	40	N	
MM5746	78 Key with N-Key/2-Key Rollover	PMOS	40	N	Parity Output

MOS/LSI COMPLEX STANDARD PRODUCTS LIST (Continued)

Product Number	Description	Process	Package		Comments
			Pins	Type	
	SHIFT REGISTER				
MM5006	Dual Dynamic 100-Bit	PMOS	14, 8	D, H	
MM5016	Dynamic 500/512-Bit	PMOS	10, 16, 8	H, D, N	
MM5034	Octal 80-Bit with TRI-STATE Outputs	NMOS	22	N	
MM5035	Octal 80-Bit w/o TRI-STATE Outputs	NMOS	20	N	
MM5104	Variable Length Dynamic	PMOS	10	H	
	ORGAN CIRCUITS				
MM5554	6 Stage Frequency Divider	PMOS	14	N	
MM5555	Chromatic Frequency Generator	PMOS	14	N	
MM5556	Chromatic Frequency Generator	PMOS	14	N	
MM5559	Serial to Parallel Converter – 33 Outputs	PMOS	40	N	
MM5823	6 Stage Frequency Divider	PMOS	14	N	
MM5824	6 Stage Frequency Divider	PMOS	14	N	
MM5832	Chromatic Frequency Generator	PMOS	14	N	
MM5833	Chromatic Frequency Generator	PMOS	14	N	
MM5837	Digital Noise Source – White Noise	PMOS	8	N	
MM5871	Rhythm Pattern Generator – 6 Rhythm	PMOS	16	N	
	ANALOG SWITCH/MULTIPLEXER				
MM450/550	Dual Differential MOS Switch	PMOS	16	4	
MM451/551	Four Channel MOS Switch	PMOS	10	H	
MM452/552	Four MOS Transistors	PMOS	14	D, F	
MM455/555	Three MOS Transistors	PMOS	16	H	
MM4501	Six Channel MOS Multiplexer	PMOS	14	D, F	Also Called AM2009
MM4503	Eight Channel MOS Multiplexer	PMOS	16	D, F, N	Also Called AM3705
MM5878	Digital Potentiometer	PMOS	16	N	

NOTES:

Total No. Bits	Part Number		Organization	Maximum Access Time (ns)	Power Supplies	Process	Package	
	–55°C to +125°C	0°C to +70°C					Pins	Type
1024	MM4220	MM5220	256 x 4, 128 x 8	650	±12	PMOS	24	D, N, J
	MM4221	MM5221	256 x 4, 128 x 8	950	+5, –12	PMOS	24	D, N, J
2048	MM4213	MM5213	512 x 4, 256 x 8	850	+5, –12	PMOS	24	D, N, J
	MM4230	MM5230	512 x 4, 256 x 8	725	±12	PMOS	24	D, N, J
2560	MM4240	MM5240	64 x 8 x 8*	500	+5, –12	PMOS	24	D, N, J
3072	MM4241	MM5241	64 x 6 x 8*	900	+5, –12	PMOS	24	D, N, J
4096	MM4214	MM5214	512 x 8	1000	+5, –12	PMOS	24	D, N, J
	MM4232	MM5232	1024 x 4, 512 x 8	1000	+5, –12	PMOS	24	D, N, J
16,384		MM52116 (2316E)	2048 x 8	450	+5	NMOS	24	D, N
32,768		MM52132	4096 x 8	450	+5	NMOS	24	D, N
65,536		MM52164	8192 x 8	450	+5	NMOS	24	D, N

*Character Generator Format

COP400 MICROCONTROLLER FAMILY GUIDE

	Specifications / COP:	ROMless Devices			Single-Chip Microcontrollers										
		402	402M	404L	410L	411L	420	420L	420C	421	421L	421C	444L	445L
MEMORY	ROM x 8	up to 1024 ext.		up to 2048 ext.	512		1024			1024			2048	
	RAM x 4	64		128	32*		64*			64*			128*	
INPUTS/OUTPUTS	Inputs	4			0		4			0			4	0
	Bidirectional TRI-STATE™ I/O	8			8		8			8			8	
	Bidirectional I/O	4			4	3	4			4			4	
	Outputs	4			4	2	4			4			4	
	Serial I/O and External Event Counter	Yes			Yes		Yes			Yes			Yes	

GENERAL	Interrupt	Yes	No	Yes	No			Yes			No			Yes	No				
	Stack Levels	3			2			3			3			3					
	MICROBUS™ Option	No	Yes	No	No			Yes	No	Yes	No			No					
	Instruction Cycle (μs)	4		16	16			4	16		4	16		16					
POWER/PKG	Supply Voltage	4.5-6.3		4.5-9.5	4.5-9.5			4.5-6.3	4.5-9.5	2.4-6.3	4.5-6.3	4.5-9.5	2.4-6.3	4.5-9.5					
	Supply Current (mA)	28		14	5			25	7	••	25	7	••	11					
	Package Size (pins)	40			24	20		28			24			28	24				

*RAM keep-alive option (except 420C/421C) **Fast 600μA, Slow 25μA, Sleep 5μA

MOS/LSI CLOCK DEVICE GUIDE

Product Number	Application	Display Type	Digits	Time Mode	Input Frequency	Output Form	Indicators					Features									Notes
												Functional					Electrical				
							AM	PM	Colon	Power Fail	Brightness	Alarm	Sleep	Snooze	Fast/Slow Set	Hrs/Mins Set	Timekeeping	Segment	Digit	Pins	
MM5309	Clock	LED	4/6	12/24 Hrs	50/60 Hz	MUX 7-Segment									•		11-19 V	2 mA	5 mA	28	Reset, Output Enable
MM5311	Clock	LED	4/6	12/24 Hrs	50/60 Hz	MUX 7-Segment									•		11-19 V	2 mA	5 mA	28	Hold, Output Enable
MM5312	Clock	LED	4	12/24 Hrs	50/60 Hz	MUX 7-Segment									•		11-19 V	2 mA	5 mA	24	1 PPS, Output Enable
MM5313	Clock	LED	4/6	12/24 Hrs	50/60 Hz	MUX 7-Segment									•		11-19 V	2 mA	5 mA	28	Hold, 1 PPS
MM5314	Clock	LED	4/6	12/24 Hrs	50/60 Hz	MUX 7-Segment									•		11-19 V	2 mA	5 mA	24	Hold
MM5315	Clock	LED	4/6	12/24 Hrs	50/60 Hz	MUX 7-Segment									•		11-19 V	2 mA	5 mA	28	Reset Hold
MM5316	Clock Radio	VF	4	12/24 Hrs	50/60 Hz	Direct 7-Segment	•	•	•	•	•	•	•	•	•		8-29 V	.5 mA		40	Four Display Modes (Time, Second, Alarm and Sleep)
MM5377	Auto Clock	VF	4	12 Hrs	2 MHz	Direct 7-Segment			•		•					•	5-20 V	.2 mA		40	Activity Indicator, Voltage Doubler
MM5378	Auto Clock	VF	4	12 Hrs	2 MHz	MUX 7-Segment			•		•					•	5-25 V	2 mA	8 mA	18	Activity Indicator
MM5382	Calendar Clock Radio	LED	4	12 Hrs	50/60 Hz	Direct 7-Segment		•	•	•	•	•	•	•	•		8-26 V	15 mA		40	Calendar (Month-Date),

MM5383	Clock Radio	LED	4	24 Hrs	50/60 Hz	Direct 7-Segment			•	•	•	•	•	•	•	8-26 V	15 mA		40	Calendar (Date-Month), Audio Alarm Tone
MM5387-AA (MM53108)	Clock Radio	LED	4	12/24 Hrs	50/60 Hz	Direct 7-Segment	•	•	•	•	•	•	•	•	•	8-26 V	8 mA		40	MM53108 is Mirror Image
MM5387-AB	Clock Radio	LED	4	12/24 Hrs	50/60 Hz	Direct 7-Segment	•	•	•	•	•	•	•	•	•	8-26 V	8 mA		40	MM5387-AA Equivalent w/ power fail detect of 10-17 V
MM53110-AA	Auto Clock	VF	4	12 Hrs	2 MHz	MUX 7-Segment			•		•				•	5-28 V	2 mA	8 mA	22	Elapse Time (19 hrs, 59 mins)
MM53110-AB	Auto Clock	VF	4	12 Hrs	2 MHz	MUX 7-Segment			•		•				•	5-28 V	2 mA	8 mA	22	Elapse Time (19 mins, 59 secs)
MM53113	Clock Radio	VF	4	12/24 Hrs	50/60 Hz	Direct 7-Segment	•	•	•	•	•	•	•	•	•	8-29 V	.5 mA		40	Pin Out Same as MM5316
MM53124	Auto Clock	VF	4	12/24 Hrs	50/60 Hz	Direct 7-Segment			•		•				•	5-25 V	.4 mA		40	Elapse Time (24 Hrs) min/secs to hrs/mins
MM5402 (MM5405)	Clock Radio	LED	4	12/24 Hrs	50/60 Hz	Direct 7-Segment	•	•	•	•	•	•	•	•	•	7-11 V	10 mA		40	MM5405 is Mirror Image
MM5406	Temperature Clock Radio	LED	4	12/24 Hrs	50/60 Hz	Duplex 7-Segment		•	•	•	•	•	•	•	•	9-11 V	20 mA		40	Duplex Display, UP/Down Setting
MM5407	Digital Thermometer	LED	4													9-11 V			14	Interface to MM5406 for Time/Temperature Clock
MM5421	Clock Radio	LED	4	12/24 Hrs	60 Hz	Duplex 7-Segment		•		•		•	•	•	•	7-11 V	20 mA		22	Duplex Display, Alarm Tone
MM5422	Clock Radio	LED	4	24 Hrs	50 Hz	Duplex 7-Segment				•		•	•	•	•	7-11 V	20 mA		22	Duplex Display, Alarm Tone
MM5423	Clock Radio	LED	4	12/24 Hrs	50/60 Hz	Duplex 7-Segment		•		•		•	•	•	•	7-11 V	20 mA		24	Duplex Display, Alarm Tone
MM5455	Clock Radio	LED	4	12/24 Hrs	50/60 Hz	Duplex 7-Segment		•		•		•	•	•	•	7-11 V	20 mA		24	Duplex Display, Alarm Tone
MM5456	Clock Radio	LED	4	12 Hr	50/60 Hz	Duplex 7-Segment		•		•		•	•	•	•	7-11 V	20 mA		22	Duplex Display, Alarm Tone

MOS/LSI CLOCK DEVICE GUIDE (Continued)

Product Number	Application	Display Type	Digits	Time Mode	Input Frequency	Output Form	Indicators					Features									Notes
												Functional					Electrical				
							AM	PM	Colon	Power Fail	Brightness	Alarm	Sleep	Snooze	Fast/Slow Set	Hrs/Mins Set	Timekeeping	Segment	Digit	Pins	
MM5457	Clock Radio	LED	4	24 Hr	50 Hz	Duplex 7-Segment				•		•	•	•	•		7-11 V	20 mA		22	Duplex Display, Alarm Tone
MM58143 (MM58183)	Clock Radio	LCD	4	12/24 Hrs	32.8 kHz	Direct 7-Segment		•	•			•	•	•	•		1.5 V	5 μA		40	Audio/Static Alarm Tone, Available in die form, MM58183 is Mirror Image
MM58144 (MM58184)	Travel Alarm Clock	LCD	4	12/24 Hrs	32.8 kHz	Direct 7-Segment		•	•			•		•	•		1.5 V	5 μA		40	Voltage Multiplier Audio/Static Alarm, MM58184 is Mirror Image

Product Number	Application	Display Type	Digits	Time Mode	Output Form	Indicators						Features														Notes
												Functional						Electrical								
						AM	PM	Colon	Alpha Day	Flag Day	Date	Hours	Minutes	Seconds	Day	Date	Month	Operating	Voltage Doubler	Voltage Tripler	Segment	Digit	Pads	Buttons*	
MM5890	Chronograph Watch	LCD	6 (2/4)	12/24 Hrs	Direct 7-Segment	•	•	•		•		•	•	•	•	•	•	1.5 V	•	•	2 μA		66	4	60 min stopwatch, 1/100 sec precision split time, lap flag, back mounting
MM58128	LCD Watch	LCD	3½ In-Line	12 Hrs	Direct 7-Segment	•	•	•				•	•	•		•	•	1.5 V	•	•	4 μA		40	2	1 Hz/4 Hz setting rate, back mounting
MM58129	LCD Watch	LCD	3½ In-Line	12 Hrs	Direct 7-Segment	•	•	•				•	•	•		•	•	1.5 V	•	•	4 μA		40	2	Available in 40-in DIP, front mounting
MM58130	LCD Watch	LCD	3½ In-Line	12 Hrs	Direct 7-Segment	•	•	•				•	•	•		•	•	1.5 V	•	•	4 μA		40	2	2 Hz/8 Hz setting rate, back mounting
MM58156	Lady's Analog Watch				Step Motor Drive									•				1.5 V					11	1	12 sec interval, available in 16-pin DIP
MM58157	Man's Analog Watch				Step Motor Drive									•				1.5 V					11	1	1 sec interval, available in 16-pin DIP
MM58175	LED Watch	LED	4 In-Line	12 Hrs	MUX 9-Segment	•	•	•	•			•	•	•	•	•	•	3 V			10 mA	60 mA	24	2	Dim mode, display time out, available in 24-pin DIP
MM58180	Alarm Watch	LCD	5½ In-Line	12 Hrs	Direct 7-Segment	•	•	•		•	•	•	•	•	•	•	•	1.5 V	•	•	2 μA		60	3	24 hr alarm, alarm indicator front mounting
MM58181	Alarm Watch	LCD	5½ In-Line	12 Hrs	Direct 7-Segment	•	•	•		•	•	•	•	•	•	•	•	1.5 V	•	•	2 μA		60	3	24 hr alarm, alarm indicator, back mounting

MOS/LSI WATCH DIE GUIDE (Continued)

Product Number	Application	Display Type	Digits	Time Mode	Output Form	Indicators						Features												
												Functional						Electrical						
						AM	PM	Colon	Alpha Day	Flag Day	Date	Hours	Minutes	Seconds	Day	Date	Month	Operating	Voltage Doubler	Voltage Tripler	Segment	Digit	Pads	Buttons*	
MM58190	Chronograph Watch	LCD	6 (2/4)	12/24 Hrs	Direct 7 Segment	•	•	•		•		•	•	•	•	•	•	1.5 V	•	•	2 μA		69	4	60 min stopwatch, chrono & lap indicators, 1/100 sec precision, split time, front mounting
MM58192	LCD Watch	LCD	6 In-Line	12/24 Hrs	Direct 7 Segment	•	•	•	•		•	•	•	•	•	•	•	1.5 V	•	•	2 μA		64	2	Month/date/day or date/month/day display format, front mounting
MM58193	LCD Watch	LCD	6 In-Line	12/24 Hrs	Direct 7 Segment	•	•	•	•		•	•	•	•	•	•	•	1.5 V	•	•	2 μA		64	2	Month/date/day or date/month/day display format, back mounting
MM58194	Chronograph Watch	LCD	6 In-Line	12/24 Hrs	Direct 7 Segment	•	•	•		•	•	•	•	•	•	•	•	1.5 V	•	•	2 μA		70	4	60 min stopwatch, 1/100 sec precision, lap indicator, front mounting
MM58195	Chronograph Watch	LCD	6 In-Line	12/24 Hrs	Direct 7 Segment	•	•	•		•	•	•	•	•	•	•	•	1.5 V	•	•	2 μA		70	4	60 min stopwatch, 1/100 sec precision, lap indicator, back mounting

* Includes Mode/Cycle/Set Switches.

Product Number	Description	Process	Package		Notes
			Pins	Type	
MM5318	Digital Clock for TV Time Display	PMOS	28	N	4/6 Digit, 12/24 Hrs, BCD or 7-Segment Outputs
MM5321	TV Camera Sync. Generator	PMOS	16	N/D	Horizontal/Vertical Control, Field Indexing and Color Burst Sync
MM5322	Color Bar Generator	PMOS	16	N/D	16 Patterns, 3.56 MHz Crystal Control
MM53100	Programmable TV Timer	CMOS	24	N	4/6 Digit, 24 Hr, 50/60 Hz Programmable TV "ON" Time, + 18 V Reference Voltage
MM53105	Programmable TV Timer	CMOS	24	N	4/6 Digit, 24 Hr, 50/60 Hz Programmable TV "ON" Time, 0 V Reference Voltage
MM53118-AA	TV Digital Tuner	NMOS	28	N	117-Channel, 3 Band + Cable TV, Up/Down or Keyboard Entry, Complete PLL Frequency Synthesizer
MM5430	AM/FM Radio Frequency Display	NMOS	40	N	AM/FM Frequency Display, 4.19 MHz Crystal or 50/60 Line Operation, Programmable IF Offset, Direct Interface to LED Display
MM5431	AM/FM Radio Frequency Display	NMOS	40	N	Mirror Image Pin-Out of the MM5430
MM55108	PLL Frequency Synthesizer	CMOS	18	N	Programmable 2^9-1 Division, 10.24 MHz Crystal provides 5 kHz Reference Frequency
MM55110	PLL Frequency Synthesizer	CMOS	24	N	Programmable 2^9-1 or 2^{10}-1 Division, 10.24 Hz Crystal provides 5 kHz or 10 kHz Reference Frequency
MM55121	PLL Frequency Synthesizer	CMOS	16	N	Programmable 2^9-1 Division, 10.24 MHz Crystal provides 5 kHz Reference Frequency, 320 kHz/300 Hz/60 Hz Buffered Outputs
MM55122	PLL Frequency Synthesizer	CMOS	18	N	Programmable 2^9-1 Division, 10.24 MHz Crystal provides 10 kHz Reference, Serial Data, 3 D to A Outputs
MM55124	PLL Frequency Synthesizer	CMOS	16	N	Programmable 2^8-1 Division, 5 kHz or 10 kHz Reference Frequency, Pin Compatible to MM55104 and MM55114
MM55126	PLL Frequency Synthesizer	CMOS	18	N	Programmable 2^9-1 Division, 5 kHz or 10 kHz Reference Frequency, Pin Compatible to MM55106 and MM55116
MM5840	TV Channel Number/Time Display	CMOS	28	N	16-Channel, 5/8 Digit, 12/24 Hr Time with Interface to MM5318, MM53100 or MM53105

MOS/LSI RADIO AND TELEVISION DEVICE GUIDE (Continued)

Product Number	Description	Process	Package		Notes
			Pins	Type	
MM5841	TV Channel Number/Time Display	CMOS	28	N	5/8 Digit, Channel (2-83) Display, 12/24 Hr Time with Interface to MM5318, MM53100 or MM53105
MM58106	Digital Clock/TV Channel Display	CMOS	28	N	5/8 Digit, Channel (2-83) or Program (1-16) Display, 12/24 Hr, 50/60 Hz
MM58142	TV Digital Tuner	NMOS	24	N	82-Channel PLL Frequency Synthesizer, Up/Down or Keyboard Entry, Interface to the MM58146
MM58146	TV Channel/Time Display	NMOS	22	N	4 Digit, Channel (2-83) Display, 12 Hr Time, Interface to the MM58142

MOS/LSI TOYS/GAMES AND TIMERS

Product Number	Description	Process	Package		Notes
			Pins	Type	
MM5780	Basic Arithmetic Educator	PMOS	24	N	8 Digit, Four Function (+, −, ×, ÷) Algebraic, "Right"/"Wrong" Indicators
MM57149	Advanced Arithmetic Educator	PMOS	28	N	Four Function (+, −, ×, ÷) Algebraic, Table/Complex/Amateur-Pro Modes Interface to Special Format Display (NSA1481)
MM5865	Universal Timer	PMOS	40	N	7 Function Modes provides Programmable Up/Down Counting, Accumulative and Total Elapse Time, Split Time

MOS/LSI TELECOMMUNICATION DEVICE GUIDE

Product Number	Description	Process	Package		Notes
			Pins	Type	
MM5393	Push Button Pulse Dialer	CMOS	18	N	60/40 break/make pulse ratio, RC oscillator, redial of last number. 600 Hz pacifier tone
MM5394	Push Button Pulse Dialer	CMOS	16	N	Same as MM5393 without pacifier tone
MM5395	DTMF (Touch Tone) Generator	CMOS	18	N/D/J	Eight (8) audio output frequencies from a 3.58 MHz crystal, operation from a 2-of-8 keypad
MM53125	DTMF (Touch Tone) Generator	CMOS	18	N/D/J	Eight (8) audio output frequencies from a 3.58 MHz crystal, operation from a single-contact keypad
MM53130	DTMF (Touch Tone) Generator	CMOS	18	N/D/J	Eight (8) audio output frequencies from a 3.58 MHz crystal, BCD/binary or 2-of-8 interface options, tone disable, single/dual tone mode select
MM53143	Push Button Pulse Dialer	CMOS	18	N	2:1 break/make pulse ratio, RC oscillator, redial of last number, 600 Hz pacifier tone
MM53144	Push Button Pulse Dialer	CMOS	18	N	2:1 break/make pulse ratio, RC oscillator, redial of last number
MM53190	Push Button Pulse Dialer	CMOS	20	N/D/J	Selectable outpulsing rate, interdigit pause and break/make ratio, redial, pacifier tone, 2 of 7 or single contact keyboard
MM58100	μ-Law Codec System	CMOS	28	N/D/J	On-chip reference, comparator, S/H, auto zero and polarity switch, requires an LF3700
MM58150	A-Law Codec System	CMOS	22	N/D/J	On-chip reference, comparator, S/H, auto zero and polarity switch, requires an LF3700

Hewlett-Packard	Description	NSC Device	Notes
HLMP-1300	Red Diffused T1	NSL5774	B, C
HLMP-1301	Red Diffused T1	NSL5774	B, C
HLMP-1302	Red Diffused T1	NSL5774	B, C
HLMP-1400	Yellow Diffused T1	NSL5374	C
HLMP-1401	Yellow Diffused T1	NSL5374	C
HLMP-1402	Yellow Diffused T1	NSL5374	C
HLMP-1500	Green Diffused T1	NSL5274	B, C
HLMP-1501	Green Diffused T1	NSL5274	B, C
HLMP-1502	Green Diffused T1	NSL5274	B, C
5082-4403	Red Diffused T1¾	NSL5056	C
5082-4440	Red Diffused T1¾	NSL5056	C
5082-4480	Red Diffused T1	NSL5086	A
5082-4483	White Diffused Red T1	NSL5081	A
5082-4484	Red Diffused T1	NSL5086	A
5082-4486	Water Clear Red T1	NSL5080	A
5082-4487	Low Profile Water Clear Red T1	NSL5080	C
5082-4488	Low Profile Water Clear Red T1	NSL5080	C
5082-4494	Red Diffused T1	NSL5086	A
5082-4550	Yellow Diffused T1¾	NSL5353A	A
5082-4555	Yellow Diffused T1¾	NSL5353A	A
5082-4557	Yellow Transparent T1¾	NSL5352A	A
5082-4558	Yellow Transparent T1¾	NSL5352A	A
5082-4584	Yellow Diffused T1	NSL5374	C

Hewlett-Packard	Description	NSC Device	Notes
5082-4650	Red Diffused T1¾	NSL5753	B
5082-4655	Red Diffused T1¾	NSL5753	B
5082-4657	Red Transparent T1¾	NSL5752	B
5082-4658	Red Transparent T1¾	NSL5752	B
5082-4684	Red Diffused T1	NSL5774	B, C
5082-4790	Low Profile Red Diffused T1¾	NSL5046	C
5082-4791	Low Profile Red Diffused T1¾	NSL5043	B, C
5082-4850	Red Diffused T1¾	NSL5053	A
5082-4855	Red Diffused T1¾	NSL5056	A
5082-4860	Red Current Regulating T1¾	NSL4944	B, C
5082-4880	Red Diffused T1¾	NSL5056	C
5082-4881	Red Diffused T1¾	NSL5057	C
5082-4882	Red Diffused T1¾	NSL5057	B, C
5082-4883	Water Clear Red T1¾	NSL5050	C
5082-4884	Water Clear Red T1¾	NSL5050	B, C
5082-4885	Water Clear Red T1¾	NSL5050	B, C
5082-4886	White Diffused Red T1¾	NSL5041	E
5082-4887	White Diffused Red T1¾	NSL5041	B, E
5082-4888	White Diffused Red T1¾	NSL5041	B, E
5082-4950	Green Diffused T1¾	NSL5253A	A
5082-4955	Green Diffused T1¾	NSL5253A	A
5082-4957	Green Transparent T1¾	NSL5252A	A
5082-4958	Green Transparent T1¾	NSL5252A	A
5082-4984	Green Diffused T1	NSL5274	B, C

LED LAMP CROSS REFERENCE GUIDE (Continued)

Monsanto	Description	NSC Device	Notes
MV5020	Water Clear Red T1¾	NSL5020	A
MV5022	Red Transparent T1¾	NSL5022	A
MV5023	Red Diffused T1¾	NSL5023	A
MV5024	Red Diffused T1¾	NSL5024	A
MV5025	Red Diffused T1¾	NSL5023	B
MV5026	Red Diffused T1¾	NSL5026	A
MV5050	Water Clear Red T1¾	NSL5050	A
MV5052	Red Transparent T1¾	NSL5052	A
MV5053	Red Diffused T1¾	NSL5053	A
MV5054-1	Red Diffused T1¾	NSL5057	A
MV5054-2	Red Diffused T1¾	NSL5057	B
MV5054-3	Red Diffused T1¾	NSL5057	D
MV5055	Red Diffused T1¾	NSL5053	A
MV5056	Red Diffused T1¾	NSL5056	A
MV5074B	Red Diffused T1	NSL5086 or 5076A	B, C
MV5075B	Red Diffused T1	NSL5086 or 5076A	C
MV5077B	Low Profile Red Diffused T1	NSL5086	B, C
MV5252	Green Transparent T1¾	NSL5252A	A
MV5253	Green Diffused T1¾	NSL5253A	A
MV5254	Green Diffused T1¾	NSL5253A	B
MV5274B	Green Diffused T1	NSL5274	C
MV5352	Yellow Transparent T1¾	NSL5352A	A
MV5353	Yellow Diffused T1¾	NSL5353A	A
MV5354	Yellow Diffused T1¾	NSL5353A	B
MV5374B	Yellow Diffused T1	NSL5374	C
MV57124	Red Rectangular	NSL57124	A
MV5752	Red Transparent T1¾	NSL5752	A

Fairchild	Description	NSC Device	Notes
FLV340	Low Profile Green Diffused T1¾	NSL5253A	E
FLV341	Low Profile Green Transparent T1¾	NSL5252A	E
FLV350	Green Diffused T1¾	NSL5253A	C
FLV351	Green Transparent T1¾	NSL5252A	C
FLV360	Green Diffused T1¾	NSL5253A	A
FLV361	Green Transparent T1¾	NSL5252A	A
FLV410	Medium Profile Yellow Diffused T1¾	NSL5353A	E
FLV411	Medium Profile Yellow Transparent T1¾	NSL5352A	E
FLV440	Low Profile Yellow Diffused T1¾	NSL5353A	E
FLV441	Low Profile Yellow Transparent T1¾	NSL5352A	E
FLV450	Yellow Diffused T1¾	NSL5353A	C
FLV451	Yellow Transparent T1¾	NSL5352A	C
FLV460	Yellow Diffused T1¾	NSL5353A	A
FLV461	Yellow Transparent T1¾	NSL5352A	A
FLV510	Medium Profile Red Diffused T1¾	NSL5753	E
FLV540	Low Profile Red Diffused T1¾	NSL5753	E
FLV550	Red Diffused T1¾	NSL5753	C
FLV560	Red Diffused T1¾	NSL5753	A

Litronix	Description	NSC Device	Notes
GL4484	Green Diffused T1	NSL5274	C
GL4850	Green Diffused T1¾	NSL5253A	A
RLC200	Red Current Regulating T1¾	NSL4944	A
RLC201	Red Current Regulating T1¾	NSL4944	B
RL-20	Red Diffused T1¾	NSL5056	A
RL-20-02	Red Transparent T1¾	NSL5052	A
RL-20-04	Water Clear Red T1¾	NSL5050	A
RL-2000	Red Diffused T1¾	NSL5057	B
RL-209	Red Diffused T1	NSL5086	C

Texas Instruments	Description	NSC Device	Notes
TIL209A	Red Diffused T1	NSL5086 or 5076A	C
TIL211	Green Diffused T1	NSL5274	C
TIL213	Yellow Diffused T1	NSL5374	C
TIL220	Red Diffused T1¾	NSL5056	A
TIL221	Water Clear Red T1¾	NSL5050	A
TIL222	Green Diffused T1¾	NSL5253A	A

Fairchild	Description	NSC Device	Notes
FLV104A	Narrow Beam Red T1½	NSL5027	C, D
FLV110	Medium Profile Red Diffused T1¾	NSL5046	E
FLV111	Medium Profile Water Clear Red T1¾	NSL5040	E
FLV112	Medium Profile White Diffused Red T1¾	NSL5041	E
FLV117	Medium Profile Red Diffused T1¾	NSL5046	E
FLV118	Medium Profile Water Clear Red T1¾	NSL5040	E
FLV140	Low Profile Red Diffused T1¾	NSL5046	C
FLV141	Low Profile Red Transparent T1¾	NSL5042	C
FLV150	Red Diffused T1¾	NSL5056	C
FLV151	Red Transparent T1¾	NSL5052	C
FLV160	Red Diffused T1¾	NSL5057	A
FLV161	Red Transparent T1¾	NSL5052	A
FLV310	Medium Profile Green Diffused T1¾	NSL5253A	E
FLV311	Medium Profile Green Transparent T1¾	NSL5252A	E

RL-209-02	Red Transparent T1	NSL5082	C
RL-209-03	White Diffused Red T1	NSL5081	C
RL-209-04	Water Clear Red T1	NSL5080	C
RL-21	Red Diffused T1¾	NSL5056	A
RL-21-02	Red Transparent T1¾	NSL5052	A
RL-21-04	Water Clear Red T1¾	NSL5050	A
RL4403	Red Diffused T1¾	NSL5056	A
RL4480	Red Diffused T1	NSL5086	C
RL4480-1	Red Diffused T1	NSL5086	B, C
RL4480-2	Red Diffused T1	NSL5086	C, D
RL4480-5	Red Diffused T1	NSL5086	C
RL4484	Red Diffused T1	NSL5086	C
RL4850	Red Diffused T1¾	NSL5053	A
RL5054-1	Red Diffused T1¾	NSL5057	A
RL5054-2	Red Diffused T1¾	NSL5057	B
RL5054-5	Red Diffused T1¾	NSL5057	A
YL4484	Yellow Diffused T1	NSL5374	C
YL4850	Yellow Diffused T1¾	NSL5353A	A

NOTES:

A = Direct substitute
B = Minor electrical or optical difference
C = Minor mechanical difference
D = Major electrical or optical difference
E = Major mechanical difference

LED NUMERIC ARRAY CROSS REFERENCE GUIDE

Hewlett-Packard	Description	NSC Device	Notes
5082-7240	.102" (2.59 mm) 8-digit array	NSA1188	D
5082-7241	.102" (2.59 mm) 9-digit array	NSA1198	D
5082-7442	.100" (2.54 mm) 12-digit array	NSA7120	A
5082-7444	.100" (2.54 mm) 14-digit array	NSA5140A	A, B, C, D
5082-7447	.112" (2.85 mm) 14-digit array	NSA5140A	B, C, D

Texas Instruments	Description	NSC Device	Notes
TIL379-12	.106" (2.69 mm) 12-digit array	NSA7120	C
TIL393-8	.102" (2.59 mm) 8-digit array	NSA1188	
TIL393-9	.102" (2.59 mm) 9-digit array	NSA1198	

Notes:
A = Minor difference in digit size
B = Minor difference in PC board length
C = Difference in pin out
D = Difference in pin location

MULTI-DIGIT LED DISPLAY CROSS REFERENCE GUIDE

PC BOARD MOUNTED DISPLAYS

National's PC board mounted LED displays represent a new concept in display packaging and do not directly replace the older, more expensive single digits still being offered by the competition. Competitive single digits must be wired by the user for either multiplex or direct drive while the NSC units are "pre-wired" on the PC board. Another variable is the number of digits per package. The National NSN series is 2 digits per package and the NSB series is 4, 5 or 6 digits per package.

Litronix	Description	NSC Device	Notes
DL3531	0.5" Red 3½ Digit, Common Anodem MUX	NSB5382	B, C, D
DK4530	0.5" Red 4 Digit, Common Anode, MUX	NSB5882	B, C, D
DL6500	0.5" Red 6 Digit, Common Cathode, MUX	NSB5931	A
Texas Instruments			
TIL361	0.5" Red Dual Digit, Common Cathode, MUX	NSN581	B, C, D

Notes:

Hewlett-Packard	Description	NSC Device
5082-7731	0.3" Red Single Digit, Common Adode	NSN334, NSN374, NSN382
5082-7740	0.3" Red Single Digit, Common Cathode	NSN373, NSN381
Monsanto		
MAN71A	0.3" Red Single Digit, Common Anode	NSN334, NSN374, NSN382
MAN74A	0.3" Red Single Digit, Common Cathode	NSN373, or NSN381
Fairchild		
FND500	0.5" Red Single Digit, Common Cathode	NSN581 or NSN583
FND507	0.5" Red Single Digit, Common Anode	NSN534, NSN582, NSN584

Hewlett-Packard	Description	NSC Device
Litronix		
DL704	0.3" Red Single Digit, Common Cathode	NSN373 or NSN381
DL707R	0.3" Red Single Digit, Common Anode	NSN334, NSN374, NSN382
DL721	0.5" Red 1-1/2 Digit, Common Anode	NSN534
DL727	0.5" Red Dual Digit, Common Anode	NSN582 or NSN584
DL728	0.5" Red Dual Digit, Common Cathode	NSN581 or NSN583
Texas Instruments		
TIL313	0.3" Red Single Digit, Common Cathode	NSN373 or NSN381
TIL321	0.5" Red Single Digit, Common Anode	NSN534, NSN582, NSN584
TIL322	0.5" Red Single Digit, Common Cathode	NSN581 or NSN583

ORDERING INFORMATION

LX 1 4 20 A FS

STANDARD OPTIONS

B — Backward Gage Version (PX6B, PX7B)
F — Fluid-Filled Version (PX4F)
N — Nylon Package (PX7N or PX7BN)
S — Stainless Steel Package (PX4S)
Z — High Common-Mode Differential Version (PX7DZ)
BN — Combine "B" and "N"
FS — Combine "F" and "S" Options (PX4FS)

PRESSURE TYPE

A — Absolute
D — Differential
G — Gage

PRESSURE RANGE (See Selection Guide)

PACKAGE TYPE

4 — Rugged Cylindrical Plumbed Fitting (PX4 Series)
6 — Hybrid IC for PCB Mounting (PX6 Series)
7 — Rugged Zinc or Nylon Housing with Optional Plumbing (PX7 Series)

TECHNOLOGY

0 — Monolithic
1 — Hybrid

DEVICE TYPE

LX — Linear Transducer, Pressure

HYBRID PRESSURE TRANSDUCER FEATURE CHART

Feature / Product	Brass Housing	Stainless Steel Housing	TO-5 Package	Ceramic Package	Nylon Housing	Zinc Housing	High Common Mode Differential Housing	Fluid Filled Isolator	Backward Gage Isolator	Hybrid	Monolithic
LX14XX Absolute	LX14XXA	LX14XXAS						LX14XXAF LX14XXAFS		LX14XXA LX14XXAF LX14XXAS LX14XXAFS	
LX16XX Absolute				LX16XXA						LX16XXA	
LX16XX Gage				LX16XXG					LX16XXGB	LX16XXG LX16XXGB	
LX16XX Differential				LX16XXD						LX16XXD	
LX17XX Absolute					LX17XXAN	LX17XXA				LX17XXA LX17XXAN	
LX17XX Gage					LX17XXGN LX17XXGBN	LX17XXG LX17XXGB			LX17XXGB	LX17XXGN LX17XXGBN	
LX17XX						LX17XXDZ	LX17XXDZ				

Absolute											
LX0603 Gage				LX0603GB					LX0603GB		LX0603GB
LX0603 Differential				LX0603D							LX0603D

HYBRID TRANSDUCER SELECTION GUIDE

MAXIMUM RATINGS

Excitation Voltage	30V
Output Current	
Source	20 mA
Sink	10 mA
Transducer Bias Current	20 mA
Operating Temperature Range	0°C to + 85°C
Storage Temperature Range	– 40°C to + 105°C
Lead Soldering Temperature (10 seconds)	260°C

TYPICAL CHARACTERISTICS

Output Voltage Sensitivity to Excitation Voltage	0.5%
Output Impedance	< 50 Ω
Electrical Noise Equivalent ($0 \leq f \leq 1$ kHz)	0.04% Span
Natural Frequency of Sensor Diaphragm	> 50 kHz
Transducer Bias Current	
LX14XXA	7-10 mA
LX16XXA, D, G	11-15 mA

HYBRID TRANSDUCER SELECTION GUIDE (Continued)

Device Type	Operating Pressure Range	Maximum Over Pressure	Guaranteed Specifications							
			Reference Temperature = 25°C V_E = 15 V_{DC}				Operating Temperature Range = 0°C to 85°C Reference Pressure = 0 psi†			
			Offset Characteristics				Span Characteristics			
			Offset Calibration V	Temp. Coefficient ± psi/°C	Repeatability ± psi	Stability ± psi	Sensitivity Calibration mV/psi	Temp. Coefficient ± psi/°C	Linearity Hysteresis Repeatability ± psi	Stability ± psi
ABSOLUTE PRESSURE DEVICES										
LX1601A, LX1701A(N)	10 to 20 psia	40 pisa	2.5 ± 0.5†	0.0054	0.05	0.3	1,000 ± 20	0.0054	0.05	0.05
LX1602A, LX1702A(N)	0 to 15 psia	40 psia	2.5 ± 0.3	0.0072	0.06	0.3	670 ± 13	0.0072	0.07	0.06
LX1603A, LX1703A(N)	0 to 30 psia	60 psia	2.5 ± 0.25	0.009	0.1	0.3	333 ± 6	0.009	0.16	0.10
LX1610A, LX1710A(N)	0 to 60 psia	100 psia	2.5 ± 0.25	0.018	0.2	0.6	167 ± 3.3	0.018	0.36	0.24
LX1420A(F)(S)	0 to 100 psia	150 psia	2.5 ± 0.25	0.030	0.4	1.0	100 ± 2	0.03	0.60	0.40
LX1620A, LX1720A(N)	0 to 100 psia	150 psia	2.5 ± 0.2	0.0216	0.4	1.0	100 ± 2	0.0216	0.60	0.40
LX1430A(F)(S)	0 to 300 psia	450 psia	2.5 ± 0.25	0.090	1.0	2.0	33.3 ± 0.67	0.09	2.0	1.0
LX1730A(N)	0 to 300 psia	450 psia	2.5 ± 0.2	0.063	1.0	2.0	33.3 ± 0.67	0.063	2.0	1.0
LX1440A(F)(S)	0 to 1000 psia	1500 psia	2.5 ± 0.25	0.3	3.5	7.0	10 ± 0.2	0.3	12.0	3.0
LX1450A(F)(S)	0 to 2000 psia	3000 psia	2.5 ± 0.25	0.6	7.0	14	5 ± 0.1	0.6	40.0	7.0
LX1460A(F)(S)	0 to 3000 psia	4500 psia	2.5 ± 0.25	0.9	10.0	20.0	3.33 ± 0.067	0.9	60.0	10.0
LX1470A(F)(S)	0 to 5000 psia	5000 psia	2.5 ± 0.25	1.5	17.0	35.0	2 ± 0.04	1.5	150.0	17.0

LX1601G(B), LX1701G(B)(N)	– 5 to + 5 psig	40 psig	7.5 ± 0.5	0.0054	0.05	0.3	1,000 ± 20	0.0054	0.05	0.05
LX1611G(B), LX1711G(B)(N)	– 5 to + 5 psig	100 psig	7.5 ± 0.5	0.0054	0.05	0.3	1,000 ± 20	0.0054	0.05	0.05
LX1602G(B), LX1702G(B)(N)	0 to 15 psig	40 psig	2.5 ± 0.3	0.0072	0.06	0.3	670 ± 13	0.0072	0.07	0.06
LX1603G(B), LX1703G(B)(N)	0 to 30 psig	60 psig	2.5 ± 0.25	0.009	0.1	0.3	333 ± 6	0.009	0.16	0.10
LX1604G(B), LX1704G(B)(N)	– 15 to + 15 psig	40 psig	7.5 ± 0.25	0.009	0.1	0.3	333 ± 6	0.009	0.16	0.10
LX1610G(B), LX1710G(B)(N)	0 to 60 psig	100 psig	2.5 ± 0.25	0.018	0.2	0.6	167 ± 3.3	0.018	0.36	0.24
LX1620G(B), LX1720G(B)(N)	0 to 100 psig	150 psig	2.5 ± 0.2	0.0216	0.4	1.0	100 ± 2	0.0216	0.60	0.40
LX1730G(B)(N)	0 to 300 psig	450 psig	2.5 ± 0.2	0.063	1.0	2.0	33.3 ± 0.67	0.063	2.0	1.0
DIFFERENTIAL PRESSURE DEVICES										
LX1601D, LX1701D	– 5 to + 5 psid	40 psid	7.5 ± 0.5	0.0054	0.05	0.3	1,000 ± 20	0.0054	0.05	0.05
LX1611D, LX1711D	– 5 to + 5 psid	100 psid	7.5 ± 0.5	0.0054	0.05	0.3	1,000 ± 20	0.0054	0.05	0.05
LX1602D, LX1702D	0 to 15 psid	40 psid	2.5 ± 0.35	0.0072	0.06	0.3	670 ± 13	0.0072	0.07	0.06
LX1603D, LX1703D	0 to 30 psid	60 psid	2.5 ± 0.3	0.009	0.1	0.3	333 ± 6	0.009	0.16	0.10
LX1604D, LX1704D	– 15 to + 15 psid	40 psid	7.5 ± 0.3	0.009	0.1	0.3	333 ± 6	0.009	0.16	0.10
LX1610D, LX1710D	0 to 60 psid	100 psid	2.5 ± 0.25	0.018	0.2	0.6	167 ± 3.3	0.018	0.36	0.24
LX1620D, LX1720D	0 to 100 psid	150 psid	2.5 ± 0.2	0.0216	0.4	1.0	100 ± 2	0.0216	0.60	0.40
LX1730D	0 to 300 psid	450 psid	2.5 ± 0.2	0.063	1.0	2.0	33.3 ± 0.67	0.063	2.0	1.0

† Reference pressure for LX1601A and LX1701A is 10 psia.

MONOLITHIC TRANSDUCER SELECTION GUIDE

ABSOLUTE MAXIMUM RATINGS

Excitation Voltage, V_E	12V
Temperature Range	−40°C to +105°C
Pressure Range	0 psia to 75 psia
Bridge Voltage, V_T	$\leq V_E$
Lead Temperature (Soldering, 10 seconds)	260°C

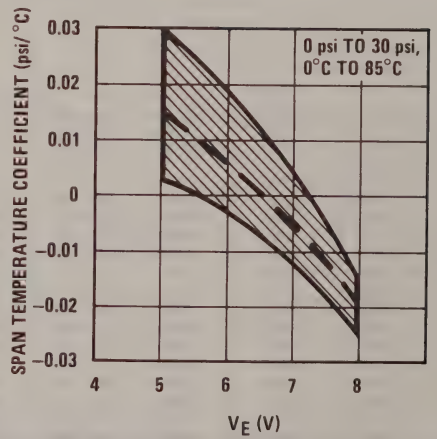
RECOMMENDED OPERATION

Excitation Voltage, V_E	7.5V
Temperature Range	0°C to 85°C
Maximum Pressure Ranges	
LX0503A	0 psia to 30 psia
LX0603GB	Vacuum to 30 psig
LX0603D	−30 psid to +30 psid

PERFORMANCE CHARACTERISTICS

Parameter	Conditions	Typical	Guaranteed	Units
Offset Calibration	0 psi		0 ± 100	mV
Offset Repeatability	0 psi		±0.1	psi

TYPICAL CHARACTERISTICS



Sensitivity	0 psi to 30 psi		2 to 8	mV/psi
Linearity, Hysteresis, Span Repeatability				
LX0503A	10 psia to 20 psia			
LX0603D	−5 psi to +5 psi		±0.15	psi
LX0603GB	0 psi to 30 psi		±0.4	psi
Span Stability	0 psi to 30 psi		±0.2	psi
Span Temp Coefficient	0 psi to 30 psi 0°C≤T≤85°C	−0.015		psi/°C
Bias Current		5		mA
Bridge Resistance		1800		Ω
Diaphragm Natural Frequency		50		kHz
Compensation Circuit Temp Coefficient,				
$\Delta V_{ET}/\Delta T$ ($V_{ET}=V_E-V_T$)	0°C≤T≤85°C			
LX0503A		10		mV/°C
LX0603DGB		8		

Note 1: Refer to definition of terms, section 16 of the 1977 Pressure Transducer Handbook.
Note 2: Unless otherwise noted, V_E = 7.5V and T = 25°C.
Note 3: Maximum common mode (line) pressure for the LX0603D is 300 psi.

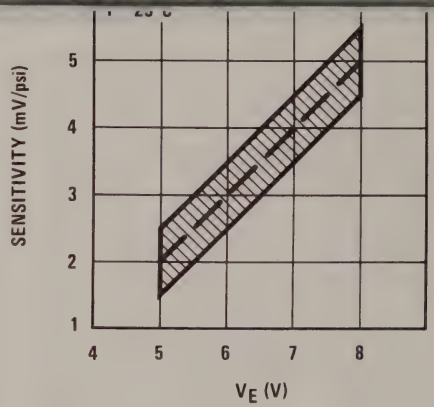


FIGURE 1b. Sensitivity

JAN IC SLASH SHEET AND INDUSTRY EQUIVALENT CROSS REFERENCE

JM38510	Indust. Equiv.	JM38510	Indust. Equiv.	JM38510	Indust. Equiv.	JM38510	Indust. Equiv.	JM38510	Indust. Equiv.	JM38510	Indust. Equiv.	JM38510	Indust. Equiv.	JM38510	Indust. Equiv.
/00101	5430	/00701	5486	/01303	54160	/02101	54L71	/02806	54L91	/04101	54L51	/05501	4009A	/06201	10504	/07801	54S181
/00102	5420			/01304	54163	/02102	54L72			/04102	54L54	/05502	4010A	/06202	10597	/07802	54S182
/00103	5410	/00801	5406	/01305	54162			/02901	54L42	/04103	54L55	/05503	4049A				
/00104	5400	/00802	5416	/01306	54161	/02103	54L73	/02902	54L43			/05504	4050A	/06301	10524	/07901	54S151
/00105	5404	/00803	5407	/01307	5490	/02104	54L78	/02903	54L44	/04201	54L121	/05505	4041A	/06302	10525	/07902	54S153
/00106	5412	/00804	5417	/01308	54192	/02105	54L74	/02904	54L46	/04202	54L122			/07001	54S00	/07903	54S157
/00107	5401	/00805	5426	/01309	54193	/02201	54H72	/02905	54L47	/04301	93L18	/05601	4017A	/07002	54S03	/07904	54S158
/00108	5405	/00901	5495			/02202	54H73	/02906	76L42A			/05602	4018A	/07003	54S04	/07905	54S251
/00109	5403	/00902	5496	/01401	54150	/02203	54H74	/02907	93L01	/04401	93L24	/05603	4020A	/07004	54S05	/07906	54S257
		/00903	54164	/01402	9312	/02204	54H76	/03001	930	/04501	93L14	/05604	4022A	/07005	54S10	/07907	54S258
/00201	5472	/00904	54165	/01403	54153	/02205	54H101	/03002	935	/04502	93L08	/05605	4024A	/07006	54S20	/08001	54S11
/00202	5473	/00905	54194	/01404	9309	/02206	54H103	/03003	936					/07007	54S22	/08002	54S15
/00203	54107	/00906	54195	/01405	54157	/02301	54H30	/03004	946	/04601	93L09	/05701	4006A	/07008	54S30	/08003	54S08
/00204	5476			/01406	54151	/02302	54H20	/03005	962	/04602	93L12	/05702	4014A	/07009	54S133	/08004	54S09
/00205	5474	/01001	5442			/02303	54H10			/04603	93L22	/05703	4015A	/07010	54S134		
/00206	5470	/01002	5443	/01501	5475	/02304	54H00	/03101	932			/05704	4021A			/08101	54S140
/00207	5479	/01003	5444	/01502	5477	/02305	54H04	/03102	944	/05001	4011A	/05705	4031A	/07101	54S74		
/00301	5440	/01004	5445	/01503	54116	/02306	54H01	/03103	957	/05002	4012A	/05706	4034A	/07102	54S112	/08201	54S85
/00302	5437	/01005	54145	/01504	9314	/02307	54H22	/03104	958	/05003	4023A	/05801	4016A				
/00303	5438	/01006	5446	/01601	5408			/03105	933	/05101	4013A	/05802	4066A	/07103	54S113	/10101	LM741
		/01007	5447	/01602	5409	/02401	54H40			/05102	4027A			/07104	54S114	/10102	LM747
/00401	5402	/01008	5448	/01701	54174	/02501	54L90	/03201	951	/05103	4043A	/05901	4028A	/07105	54S174	/10103	LM101A
/00402	5437	/01009	5449	/01702	54175	/02502	54L93							/07106	54S175	/10104	LM108A
/00403	5425					/02503	54L193	/03301	945	/05201	4000A	/06001	10501			/10105	LH2101A
/00404	5427	/01101	54181	/01801	54170	/02504	93L10	/03302	948	/05202	4001A	/06002	10502	/07201	54S40	/10106	LH2108A
		/01102	54182			/02505	93L16	/03303	950	/05203	4002A	/06003	10505	/07301	54S02	/10107	LM118
/00501	5450			/01901	54180			/03304	9093	/05204	4025A	/06004	10506				
/00502	5451	/01201	54121			/02601	54L86					/06005	10507	/07401	54S51	/10201	LM723
/00503	5453	/01202	54122	/02001	54L30	/02701	54L02	/03501	MH0026	/05301	4007A	/06006	10509	/07402	54S64		
/00504	5454	/01203	54123	/02002	54L20					/05302	4019A			/07403	54S65	/10301	LM710
		/01204	9601	/02003	54L10	/02801	54L95	/04001	54H50	/05303	4030A	/06101	10531			/10302	LM711
/00601	5482	/01205	9602	/02004	54L00	/02802	54L164	/04002	54H51	/05304	4048A	/06102	10631	/07501	54S86	/10303	LM106
/00602	5483			/02005	54L04	/02803	93L28	/04003	54H53			/06103	10576	/07502	54S135	/10304	LM111
/00603	9304	/01301	5492	/02006	54L03	/02804	93L00	/04004	54H54	/05401	4008A	/06104	10535			/10305	LH2111
/00604	5480	/01302	5493	/02006	54L01F	/02805	76L70	/04005	54H55					/07601	54S194	/10401	55107
														/07602	54S195		

JAN IC SLASH SHEET AND INDUSTRY EQUIVALENT CROSS REFERENCE (Continued)

JM38510	Indust. Equiv.
/10402	55108
/10403	55114
/10403	9614
/10404	55115
/10404	9615
/10405	55113
/10406	7831
/10407	7832
/10408	7820
/10409	7830
/10601	LM102
/10602	LM110
/10603	LH2110
/10701	LM109
/10702	LM141-5V (0.5A)
/10703	LM141-12V (0.5A)
/10704	LM141-15V (0.5A)
/10705	LM141-24V (0.5A)
/10706	LM140-5V (1.0A)
/10707	LM140-12V (1.0A)
/10708	LM140-15V (1.0A)
/10709	LM140-24V (1.0A)
/10801	3018A
/10802	3045
/10901	555
/10902	556
/11001	LM148
/11002	LM149
/11003	4741, 4156
/11004	4136
/15203	54156
/15204	8250
/15205	8251
/15206	8252
/15301	54125
/15302	54126
/15501	54H08
/15502	54H11
/15503	54H21
/15601	54147
/15602	54148
/15603	9318
/15701	9338
/15801	9321
/15802	9317
/15901	9300
/15902	9328
/16001	9334
/16101	5432
/16201	5428
/16301	54365
/16302	54366
/16303	54367
/16304	54368
/17001	4081B
/17002	4082B
/17003	4073B
/17304	4555B
/17305	4556B
/20101	HYPROM512
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/20202	54S287
/20202	IM5623
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/20301	7610
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/20302	54S287
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/20302	82S129
/20401	54S570
/20401	7620
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/20402	54S571
/20402	7621
/20402	82S131
/20601	54S572
/20601	7642
/20602	54S573
/20602	7643
/20603	7644
/20701	DM54S188
/20701	7602
/20702	DM54S288
/20702	7603
/23002	93411
/23003	54S200
/23003	93421
/23201	2102
/23501	TMS4060 (85°C MAX)
/23502	TMS4050 (85°C MAX)
/23503	TMS4060 (100°C MAX)
/23504	TMS4050 (100°C MAX)
/23505	MM4280 (85°C MAX)
/23506	MM4280 (100°C MAX)
/23601	6605
/23602	6604
/23603	6605 (100°C MAX)
/23604	6604 (100°C MAX)
/23701	9130
/23702	91L30
/23703	9140
/23704	91L40
/23901	MM54C929
/23901	6508
/23902	MM54C930
/23902	6518
/30001	54LS00
/30002	54LS03
/30003	54LS04
/30004	54LS05
/30005	54LS10
/30006	54LS12
/30007	54LS20
/30008	54LS22
/30110	54LS76
/30201	54LS40
/30202	54LS37
/30203	54LS38
/30301	54LS02
/30302	54LS27
/30303	54LS266
/30401	54LS51
/30402	54LS54
/30501	54LS32
/30502	54LS86
/30601	54LS194
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/30606	54LS295
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/30701	54LS138
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/30801	54LS181
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/31501	54LS90
/31502	54LS93
/31503	54LS160
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/31505	54LS168
/31506	54LS169
/31507	54LS192
/31508	54LS193
/31509	54LS191
/31510	54LS92
/31511	54LS162
/31512	54LS163
/31513	54LS190
/31601	54LS75
/31602	54LS279
/32001	54LS196
/32002	54LS197
/32003	54LS290
/32004	54LS293
/32102	54LS26
/32201	54LS365
/32202	54LS366
/32203	54LS367
/32204	54LS368

/15001	5485	/17103	4075B	/20902	82S185	/30102	54LS74	/31001	54LS11	/33106	25LS174
/15002	9324	/17201	4085B	/20902	7685	/30103	54LS112	/31002	54LS15	/33107	25LS175
/15101	5413	/17202	4086B	/20903	82S180	/30104	54LS113	/31003	54LS21	/40001	6800
/15102	5414	/17203	4070B	/20903	7680	/30105	54LS114	/31004	54LS08	/40101	6821
/15103	54132	/17204	4077B	/20904	82S181	/30106	54LS174	/31101	54LS85	/42001	8080A
/15201	54154	/17301	4514B	/20904	7681	/30107	54LS175	/31201	54LS83A	/42101	8212
/15202	54155	/17302	4515B	/23001	93410	/30108	54LS107	/31202	54LS283	/44001	2901A
		/17303	4532B	/23002	54S206	/30109	54LS109			/44201	2918
										/46001	9900A

HOW TO ORDER JAN INTEGRATED CIRCUITS

THE MIL-M-38510 PART NUMBER

JM38510/XXXXXYYY

- The lead finish:
  A = solder dipped
  B = tin plate
  C = gold plate
  X = any lead finish above is acceptable
- The device package:
  (See package code table)
- The screening level:
  S, B, or C
- The device number on the slash sheet
- The slash sheet number
- Mil-M-38510

THE JAN PACKAGE CODES:

38510 Package Designation	Microcircuit Industry Description	National Equivalent Package
A	14 pin 1/4" x 1/4" (metal) flat pack	F
B	14 pin 3/16" x 1/4" flat pack	None
C	14 pin 1/4" x 3/4" dual-in-line	J/D
D	14 pin 1/4" x 3/8" flat pack	W
E	16 pin 1/4" x 7/8" dual-in-line	J/D
F	16 pin 1/4" x 3/8" (metal or ceramic) flat pack	F/W
G	8 pin TO-99 can or header	H
H	10 pin 1/4" x 1/4" flat pack	F
I	10 pin TO-100 can or header	H
J	24 pin 1/2" x 1-1/4" dual-in-line	J/D
K	24 pin 3/8" x 5/8" flat pack	None
M	12 pin TO-101 can or header	G
P	8 pin 1/4" x 3/8" dual-in-line	J
Q	40 pin 0.6" x 2.0" dual-in-line	J/D
V	18 pin 0.3" x 0.9" dual-in-line	J/D
W	22 pin 0.4" x 1.2" dual-in-line	J/D
X, Y, Z	Unassigned — Reserved for identifying special packages whose dimensions are carried in the detail specifications.	None, None, None

SALES OFFICES AND REPRESENTATIVES

ALABAMA

* **National Semiconductor**
Dixie Regional Office
3322 Memorial Pkway, S.W.
Suite 14
Huntsville, Alabama 35801
(205) 881-0622
TWX: 810-726-2128

Interep Associates, Inc.
3116 Triana Boulevard, S.W.
Suite 67
Huntsville, Alabama 35805
(205) 533-1730
TWX: 810-726-2207

ARIZONA

* **National Semiconductor**
Rocky Mountain Regional Office
7353 Sixth Avenue
Scottsdale, Arizona 85251
(602) 945-8473
TWX: 910-950-1195

Fred Board Associates
7353 East 6th Avenue
P.O. Box 1906
Scottsdale, Arizona 85252
(602) 994-9388
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* **National Semiconductor**
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TWX: 910-338-0537

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3350 Scott Boulevard, Bldg. 44
Santa Clara, California 95051
(408) 988-6300

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4827 Sepulveda, Suite 290
Sherman Oaks, California 91403
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TWX: 910-495-1773

Great American Rep Co.
Valley Freeway Center Building
15300 Ventura Blvd., Suite 405
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(213) 990-4870

* **National Semiconductor**
Western Area Office
17870 Sky Park Circle #108
Irvine, California 92714
(714) 957-1626
TWX: 910-595-2593

Great American Rep Co.
17742 Irvine Blvd., Suite 102
Tustin, California 92680
(714) 832-8113
TWX: 910-595-1523

* **National Semiconductor**
District Sales Office
4617 Ruffner Street, Suite 206
San Diego, California 92111
(714) 560-8330
TWX: 910-335-1566

S.R. Electronics
4617 Ruffner Street, Suite 206
San Diego, California 92111
(714) 560-8330
TWX: 910-335-1566

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* Electrodyne, Inc.
4600 East Asbury Circle
Suite 402
Denver, Colorado 80222
(303) 759-4409
TWX: 910-931-0428

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Wilton Center
Wilton, Connecticut 06897
(203) 762-0378
TWX: 710-479-3512

NRG Limited
50 Post Road
Westport, Connecticut 06880
(203) 226-7527
TWX: 710-457-2169

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1001 N.W. 62nd Street, Suite 110
Ft. Lauderdale, Florida 33309
(305) 772-6970
TWX: 510-955-9708

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Altamont Springs, Florida 32701
(305) 331-0341

QXI
300 - 31st Street North 319
St. Petersburg, Florida 33713
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TWX: 810-863-0354

QXI
4620 W. Commercial Boulevard
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3185N Terrace Court
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Glen Burnie, Maryland 21061
(301) 768-2800
TWX: 710-867-0508

MASSACHUSETTS

* **National Semiconductor**
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33 Haydon Avenue
Lexington, Massachusetts 02173
(617) 861-6520
TWX: 710-326-0572

A/D Systems Sales, Inc.
594 Marrett Road
Lexington, Massachusetts 02173
(617) 861-6370

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* Cen Tech
10312 E. 63rd Terrace
Raytown, Missouri 64133
(816) 358-8100
TWX: 910-771-2007

Cen Tech
514 Earth City Plaza #341
Earth City, Missouri 63045
(314) 291-4230
TWX: 910-762-0698

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* **National Semiconductor**
Mid-Atlantic Regional Office
140 Rte. 17 North, Suite 201
Paramus, New Jersey 07652
(201) 967-5300
TWX: 710-990-4962

New Jersey NECCO
2460 Lemoine Avenue
Fort Lee, New Jersey 07024
(201) 461-2789
Telex: 134-526

Metropolitan Area

LEJ Component Sales
401 Broad Hollow Road
Melville, New York 11746
(516) 694-9090

National Semiconductor
Mid-Atlantic Regional Office
(516) 921-2589
TWX: 710-479-3512

NORTH CAROLINA

Engineering Devices Corporation
4711 Charlottesville Road
P.O. Box 19104
Greensboro, North Carolina 27410
(919) 852-3888
TWX: 510-922-7393

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* **National Semiconductor**
East Central Regional Office
293 Alpha Park
Highland Heights, Ohio 44143
(216) 461-0191
TWX: 810-427-2972

Arlington Heights, Illinois 60004
(312) 253-9440
TWX: 910-687-2273

INDIANA

National Semiconductor
North-Central Regional Office
6910 North Shadeland, Suite 204
Indianapolis, Indiana 46240
(317) 842-5006
TWX: 810-260-1437

Advanced Component Sales
P.O. Box 26407
5746 Brendon Way West Drive
Indianapolis, Indiana 46226
(317) 545-6441
TWX: 810-341-3233

Advanced Component Sales
1010 Memorial Way, Suite 1
Fort Wayne, Indiana 46805
(219) 484-0722
TWX: 810-332-1472

IOWA

Gassner & Clark Co.
1834 Blairs Ferry Road N.E.
Cedar Rapids, Iowa 52402
(319) 393-5763
TWX: 910-525-2051

National Semiconductor
District Sales Office
32969 Hamilton Ct., Suite 111
Farmington Hills, Michigan 48018
(313) 553-0600
TWX: 810-242-2902

* Representative of Electronic Products
No. Park Office Plaza
17117 West 9-Mile Road, Suite 1727
Southfield, Michigan 48075
(313) 559-1080
TWX: 810-224-4976

Representative of Electronic Products
3501 Lake Eastbrook S.E.
Grand Rapids, Michigan 49506
(616) 942-1320

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* **National Semiconductor**
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Minneapolis, Minnesota 55431
(612) 888-3060
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* Stan Clothier Co.
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Minneapolis, Minnesota 55435
(612) 944-3456
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237 Eubank N.E.
Albuquerque, New Mexico 87123
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* **National Semiconductor**
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Syracuse, New York 13211
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TWX: 710-541-0418

Electra Sales Corp.
100 White Spruce Boulevard
Rochester, New York 14623
(716) 461-1590

National Semiconductor
IBM District Sales Office
576 South Road, Room 128
Poughkeepsie, New York 12601
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293 Alpha Park
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Micro-Tec, Inc.
6302 Busch Blvd, Suite 218
Columbus, Ohio 43229
(614) 888-9761

* Micro-Tec, Inc.
8023 Towson Boulevard
Miamisburg, Ohio 45342
(513) 866-0380

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Vantage Corp.
6415 S.W. Canyon Road, Suite 220
Portland, Oregon 97221
(503) 297-1714

PENNSYLVANIA

* **National Semiconductor**
Liberty Regional Office
275 Commerce Drive, Suite 207
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(215) 643-4910
TWX: 510-661-3986

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1 Fairway Plaza Philmont Avenue
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Huntingdon Valley, PA 19006
(215) 947-4135
TWX: 510-665-5485

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Cross Creek #2002
Knoxville, Tennessee 37921
(615) 588-3710
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P.O. Box 87
Garland, Texas 75040
(214) 276-7151
TWX: 910-860-5097

* Carter Associates, Inc.
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Houston, Texas 77057
(713) 789-1680
TWX: 910-881-2466

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Salt Lake City, Utah 84115
(801) 486-3801

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* **National Semiconductor**
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TWX: 910-443-2318

Vantage Corp.
300 - 120th Avenue N.E.
Building 7, Suite 207
Bellevue, Washington 98005
(206) 455-3460

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* **National Semiconductor**
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Malton, Ontario L4T 3J9
(416) 677-6633
TWX: 610-492-4012

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Suite 130
St Laurent
Montreal, Quebec H4M 2M4
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Thiko S.A.
Peru 653
Buenos Aires 1068, Argentina
Tel: 33-4879/30-4132
Telex: 17825 SEMIS AR

DESAC — Distribuidora Electronica S.A.C.
Santa Rosa, 3803
1602 Florida, Buenos Aires, Argentina

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Bayswater, Victoria 3153
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Telex: 32096

Alfatronic
Av. Reboucas, 1498
05402 Sao Paulo, Brasil
Tel: 282-0915/280-3526
Telex: 1124317 ALFA BR

Filcres
Rua Aurora 165
01209 Sao Paulo, Brasil
Tel: 222-4170/221-3993

Repil
Rua Aurora, 279
01209 Sao Paulo, Brasil
Tel: 220-5322

Teleimport Electronica Ltda
Rua Santa Ifigenia,
402-9/10 Andares
01207 Sao Paulo, Brasil
Tel: 222-2122

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Rodolfo Baffico G.
Avda Gertrudis Echenique 345-A
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Expansion 10000
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92 260 Fontenay-aux-Roses
Tel: (01) 6608140
Telex: 250956

Application Electronique
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30001 Nimes Cedex
Tel: (66) 849906
Telex: 480569

Application Electronique
10, Rue du Chapeau Rouge
31300 Toulouse
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Telex: 520815

Ets Debelle
13, Rue Baptiste Marcel
Z1 Fontaine Sassenege
38600 Fontaine
Tel: (76) 265654
Telex: 320000

Generim
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91403 Orsay
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RTF Distronique
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92202 Neuilly
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94150 Rungis
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Telex: 204674

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Telex: 700627

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Telex: 61 007 Natsem B

J.P. Lemaire
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1020 Bruxelles, Belgium
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Telex: 24610

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NS Electronics do Brasil
Avda Brigadeiro Faria Lima 830
Octavo Andar, Conjunto 82/83/84
Jardim Paulistano, Cep 01452
Sao Paulo, Brasil
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Telex: 1121008 CABINE
SAO PAULO

Rimel
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Pereira, Colombia
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Telex: 8828

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Telex: 2137 Granja San Jose
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Telex: 33355

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Telex: 120263

Facen Nancy
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54140 Jarville la Malgrange
Tel: (28) 510005
Telex: 961032

Facen Rouen
Z1 Boulevard Lenine
76800 Saint-Etienne-du-Rouvray
Tel: (35) 653603
Telex: 770671

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6, Rue Vauban
67450 Mundolsheim
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Telex: 890400

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94262 Fresnes
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Telex: 204802

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National Semiconductor GmbH
Elsenheimer StraBe 61/11
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Tel: (089) 576091
Telex: 52-2772

National Semiconductur GmbH
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6380 Bad Homburg
Tel: (06172) 23011
Telex: 41-5887

National Semiconductor GmbH
JessenstraBe 4
2000 Hamburg 50
Tel: (040) 381454
Telex: 21-1039

National Semiconductor GmbH
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6000 Frankfurt/Main 1
Tel: (0611) 720416/8
Telex: 41-3590

EBV Elektronik
Gabriel-Max-StraBe 72
8000 Munchen 90
Tel: (089) 644055
Telex: 52-4535

Ing. Buro Dreyer
Flensburger StraBe 3
2380 Schleswig
Tel: (04621) 23121
Telex: 22-1334

PANEL Electronic
Hermann-Oberth-StraBe 7
8011 Putzbrunn/Munchen
Tel: (089) 464024
Telex: 52-9238

HONG KONG

NS Electronics (Hong Kong) Ltd.
8th Floor
Cheung Kong Electronic Bldg.
4 Hing Yip Street 5-11/F
Kwun Tong, Kowloon
Tel: 3-899235
Telex: 73866 NSEHK HX
Cable: Natsemi HK

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Sujata Sales & Exports Ltd.
112 Bajaj Bhavan
Nariman Point
Bombay 400 021, India
Tel: 234658
Telex: 0113855/0114209

Sujata Sales & Exports Ltd.
2C, Camac Street
(Jamair Compound)
Calcutta 17, India

Sujata Sales & Exports Ltd.
204 Kaisons House
84 Nehru Place
New Delhi 110 024 India

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National Semiconductor SRL
Via Solferino, 19
20121 Milano
Tel: 630410/630414/630862/661542
Telex: 332835

Rep-co SRL
Via Alberto Mario 26
20149 Milano
Tel: (02) 4985932/4985274
Telex: 332835

Rep-co SRL
Via Val Pellice 71
00141 Roma
Tel: (06) 8107788
Telex: 612393

Adelsy S.p.A
Via Domenichino, 12
20149 Milano
Tel: (02) 4985051-5
Telex: 332423

Adelsy S.p.A.
Piazza Della Vittoria, 15
16121 Genova
Tel: (010) 589674

ESE SRL
Via Villa Mirabello 6
20125 Milano
Tel: (02) 600733
Telex: 334022

Intelco S.a.s.
Viale de Amicis, 165
50137 Firenze
Tel: (055) 608107
Telex: 573016

Intelco S.a.s.
Via Crocetta 38
40012 Lippo di Calderara
(Bologna)
Tel: (051) 726186
Telex: 510524

Inter-Rep S.p.A.
Via Prarostino, 10
10143 Torino
Tel: (011) 752075
Telex: 221422

Intesi
Via XXV Aprile
20097 S. Donato Milanese
(Milano)
Tel: (02) 51741

BenzstraBe 1
7016 Gerlingen
Tel: (07156) 23051
Telex: 72-45266

RTG-Distron
Behaimstr. 3
1000 Berlin 10
Tel: (030) 3421041/45
Telex: 18-5478

RTG E. Springorum KG
Bronner StraBe 7
4600 Dortmund
Tel: (0231) 54951
Telex: 82-2534

Sasco GmbH
Hermann-Oberth-StraBe 16
8011 Putzbrunn
Tel: (089) 46111
Telex: 52-9504

GREECE

Peter Caritato
P.O. Box 3353
Kolonaki-Athens
Tel: (21) 718338
Telex: 214716

5-5-89/50, 1st Floor
Sara Iron Market, Ranigunj
Secunderabad 500 003 India

Sujata Sales & Exports Ltd.
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5th Block, Jayanagar
Bangalore 560041, India

(U.S.A. based rep for Sujata)
American Components Inc.
3350 Scott Blvd. Bldg. 15
Tel: (408) 727-2440

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Electronic Microsystems Ltd.
94 University Avenue
P.O. Box 39390
Tel Aviv, Israel
Tel: (03) 424602
Telex: 341270

(U.S.A. based rep for
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California Microsystems Ltd.
6855 Tujunga Avenue
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35100 Padova
Tel: (049) 45600/45778

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Via Divigna Murata, 1/A
00143 Roma
Tel: (06) 594559/5919107
Telex: 613072

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C.so Matteotti 32A
10121 Torino
Tel: (011) 539141/543175
Telex: 220146

Adelsy S.p.A
Via Marangoni, 45/48
33100 Udine
Tel: (0432) 26996

EDL S.p.A.
Viale Augusto, 29
80125 Napoli
Tel: (081) 632335

ESCO Italiana SRL
Via Villa Mirabello, 6
20125 Milano
Tel: (02) 6072441-45
Telex: 331497

Via Tor Sapienza 208
00155 Roma
Tel: (06) 2275130/2273372
Telex: 611163

Intesi
C.so Traino, 28/15
10135 Torino
Tel: (011) 613963

Intesi
Via Paparotti 5/4
33100 Udine
Tel: (0432) 27094

S.I.D.E.
Strada Statale 16-KM311
60028 Osimo Scalo (Ancona)
Tel: (071) 79307

JAPAN

NS International Inc., Japan
Daini Maejima Bldg. 9/F
1-9, Yotsuya, Shinjuku-ku
Tokyo 160, Japan

NS International Inc., Japan
Miyake Bldg. 6F
1-9, Yotsuya, Shinjuku-ku
Tokyo 160, Japan

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Osaka 533

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1-2 Marunouchi 2-Chome
Cyiyoda-ku,
Tokyo 100, Japan
Tel: (03) 218-5571
Telex: J24616

Takachiho Koheki K.K.
Nakamura Bldg.
1-2 Yotsuya, Shinjuku-ku
Tokyo 160, Japan
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Telex: 232-2315 TRATOK

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National Semiconductor Hong Kong Ltd.
Korea Liaison Office
6th Floor, Kunwon Bldg.
1-2 Mookjung-Dong
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C.P.O. Box 7941 Seoul
Tel: 267-9473
Telex: K24942

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Prol. Moctezuma Ote, 24
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Mexico 21, D.F., Mexico
Tel: 554-8300

NETHERLANDS
Rodelco B.V. Electronic
Verrijn Stuartlaan 29
Rijswijk ZH2109
Tel: (070) 995750
Telex: 32506

NEW ZEALAND
NS Electronics Pty. Ltd.
P.O. Box 3335
Auckland, New Zealand
Tel: 469-450
Cable: PROTON

Professional Electronics Ltd.
126 Kitchener Road
Auckland, New Zealand
Tel: 493-029
Telex: 7421084

NORWAY
Multikomponent
P.O. Box 130
Kaldbakken, Oslo 9
Tel: (02) 162610
Telex: 16993

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Fairlane House
415 Commissioner Street
Fairview, South Africa
2001 Johannesburg
Tel: 618-1027
Telex: 58-6268

SPAIN
Diode Espana
Avda Brasil 7
Madrid 20
Tel: (01) 455-0139/455-3686
Telex: 42148

Sisteco
Corcega 167
Barcelona 36
Tel: (03) 321-7347/321-7392
Telex: 51990

SWEDEN
National Semiconductor AB
Algrytevagen 23
12732 Skarholmen
Tel: (08) 970835
Telex: 10731

Minteke Supply Company Ltd.
No. 15, Lane 133
Tai Yuan Road, Taipei
Tel: 563-4375

TURKEY
Turkelek Elektronik Ltd.
Ataturk Boulevard 169
Ankara
Tel: 189483
Telex: 42120

Turkelek Elektronik Ltd.
Tophane Is Hani Kat. 4 No. 406
Tophane, Istanbul
Tel: 434046
Cable: Turkelek-Istanbul

Elektronika
Sahne Sokak
Ali Han Kat:5 No. 506
Galatasaray, Istanbul
Tel: 454066/432785
Cable: Tronika-Istanbul

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Bedford MK 40 ITR UK
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Tong Baek Building
155-12, Yumli-Dong, Mapo-Ku
Seoul, Korea
Tel: 33-6625/33-6998
Telex: K28569 TBTRACO
Cable: "Tallmankim" Seoul

MALAYSIA
Micro Machining SDN BHD
Bayan Lepas, Penang
Malaysia
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Telex: MA 40061 or 40136
Cable: NS Elect Penang

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Luis Gonzalez Gonzalez
c/o NS Mexico
11 de Abril No. 286-7
Mexico 18, D.F., Mexico

Manuel Chacon
Hegel 153 Desp 204
Mexico 5, D.F.
Tel: (905) 531-1689
Telex: TELECOINTLA
MEX 017-74349

Mexel
Tlacoquemecatl 139-401
Mexico 12, D.F. Mexico
Tel: 575-7868/575-7924

NS Electronics Philippines Inc.
Electronics Avenue, FTI Complex
Taguig, Metro Manila
Tel: 8287571/8280031
Telex: 3882 NSPH PN

PORTUGAL
Ditram Components
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Av. Miguel Bombarda 133
Lisboa 1
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Telex: RS24402
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Cape Town 8000, South Africa
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Telex: 57-7320 CT

16126 Bromma/Stockholm
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Tel: 01/830 27 27
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Fenner Elektronik AG
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4450 Sissach
Tel: (061) 982202
Telex: 63235

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National Semiconductor
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National Semiconductor
Taiwan Ltd.
4/F, No. 16-3, Lane 193,
Lin Sen 3rd Road
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Tel: (07) 223254

Leicester, Britain
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Telex: 341485

D.T.V. Group Ltd.
2-12 Ernest Avenue
West Norwood
London, S.E. 27, Britain
Tel: (01) 670-6166
Telex: 262415

Farnell Electronic
Components Ltd.
Canal Road, Leeds
Yorkshire LS12 2TU Britain
Tel: (0532) 636311
Telex: 55147

ITT Electronic Services
Edinburgh Way
Harlow, Essex, Britain
Tel: (0279) 26777
Telex: 81525

Jermyn Industries
Vestry Estate
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Tel: (0732) 51174
Telex: 95143

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Telex: 86631

Swift Hardman Electronics
Baillie Street, P.O. Box 23
Rochdale, Lancashire, Britain
Tel: (0706) 47411
Telex: 63237

URUGUAY
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Alberto Domingo
Gustavo Gallinal 1995
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VENEZUELA
Microtel Electronica S.A.
Crucetita a Porvenir
Edif. Alba, Mezzanina 2
Caracas 101, Venezuela
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Telex: 26455 Micro

P. Benavides S.R.L.
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Ibars y Cia, S.A.
Apartado 68493
Caracas 106, Venezuela

YUGOSLAVIA
Eltrade S.p.A.
Via Francisco
Parisi 6
34100 Trieste, Italy
Tel: (040) 827395
Telex: 460258

Inches		Centimeters	Centimeters		Inches
1	=	2.54001	1	=	0.39370
2	=	5.08001	2	=	0.78740
3	=	7.62002	3	=	1.1811
4	=	10.16002	4	=	1.5748
5	=	12.70003	5	=	1.9685
6	=	15.24003	6	=	2.3622
7	=	17.78004	7	=	2.7559
8	=	20.32004	8	=	3.1496
9	=	22.86005	9	=	3.5433

Feet		Meters	Meters		Feet
1	=	0.304801	1	=	3.28083
2	=	0.609601	2	=	6.56167
3	=	0.914402	3	=	9.84250
4	=	1.219202	4	=	13.12333
5	=	1.524003	5	=	16.40417
6	=	1.828804	6	=	19.68500
7	=	2.133604	7	=	22.96583
8	=	2.438405	8	=	26.24666
9	=	2.743205	9	=	29.52750

Yards		Meters	Meters		Yards
1	=	0.914402	1	=	1.093611
2	=	1.828804	2	=	2.187222
3	=	2.743205	3	=	3.280833
4	=	3.657607	4	=	4.374444
5	=	4.572009	5	=	5.468056
6	=	5.486411	6	=	6.561667
7	=	6.400813	7	=	7.655278
8	=	7.315215	8	=	8.748889
9	=	8.229616	9	=	9.842500

CONVERSION TABLES (Continued)

Miles	Kilometers	Kilometers	Miles
1	1.60935	1	0.62137
2	3.21869	2	1.24274
3	4.82804	3	1.86411
4	6.43739	4	2.48548
5	8.04674	5	3.10685
6	9.65608	6	3.72822
7	11.26543	7	4.34959
8	12.87478	8	4.97096
9	14.48412	9	5.59233

Pounds Av.	Kilograms	Kilograms	Pounds Av.
1	0.45359	1	2.20462
2	0.90718	2	4.40924
3	1.36078	3	6.61387
4	1.81437	4	8.81849
5	2.26796	5	11.02311
6	2.72155	6	13.22773
7	3.17514	7	15.43236
8	3.62874	8	17.63698
9	4.08233	9	19.84160

COUNTRY	STANDARD TIME: Hours fast or slow of GMT	STANDARD TIME: Time at 1200 hrs. GMT	Countries observing Daylight Saving Time during local Summer (S) or Winter (W) season and dates of observance if available.
ABU DHABI	+ 4	16 00	
ADEN	+ 3	15 00	
AFGHANISTAN	+ 4½	16 30	
ALBANIA	+ 1	13 00	(S) (+1 hr.)
ALGERIA	GMT	12 00	
ANGOLA	+ 1	13 00	
ARGENTINA	− 3	09 00	(S) (+1 hr.)
AUSTRALIA—Victoria, New South Wales, Queensland	+10	22 00	(S) (+1 hr.) Oct. 27–Mar. 1
Tasmania	+10	22 00	(S) (+1 hr.) Oct. 27–Mar. 1
South Australia, Northern Territory	+ 9½	21 30	(S) (+1 hr.) Oct. 27–Mar. 1
Western Australia	+ 8	20 00	(S) (+1 hr.) Oct. 27–Mar. 1
AUSTRIA	+ 1	13 00	
AZORES	− 1	11 00	
BAHAMAS	− 5	07 00	(S) (+1 hr.) Apr. 27–Oct. 25
BAHRAIN ISLAND	+ 3	16 00	
BANGLADESH	+ 6	18 00	
BELGIUM	+ 1	13 00	
BELIZE	− 6	06 00	
BERMUDA	− 4	08 00	(S) (+1 hr.) Apr. 27–Oct. 25
BOLIVIA	− 4	08 00	
BOTSWANA	+ 2	14 00	
BRAZIL—Eastern	− 3	09 00	
Espirito Santo, Guanabara, Minas Gerais, Rio de Janeiro, Sao Paulo	− 3	09 00	
Western Interior	− 4	08 00	
Territory of Acre	− 5	07 00	
BULGARIA	+ 2	14 00	
BURMA	+ 6½	18 30	
BURUNDI	+ 2	14 00	
CAMBODIA (Khmer Republic)	+ 7	19 00	
CAMEROON	+ 1	13 00	
CANADA—Newfoundland	− 3½	08 30	(S) (+1 hr.) Apr. 27–Oct. 25
Atlantic Time	− 4	08 00	(S) (+1 hr.) Apr. 27–Oct. 25
Eastern Time	− 5	07 00	(S) (+1 hr.) Apr. 27–Oct. 25
Central Time	− 6	06 00	(S) (+1 hr.) Apr. 27–Oct. 25
Mountain Time	− 7	05 00	(S) (+1 hr.) Apr. 27–Oct. 25
Pacific Time	− 8	04 00	(S) (+1 hr.) Apr. 27–Oct. 25
Whitehorse, Dawson City	− 9	03 00	
CANARY ISLANDS	GMT	12 00	(S) (+1 hr.) Apr. 13–Oct. 4
CAPE VERDE ISLANDS	− 2	10 00	
CAROLINE ISLANDS			
Palau Is.	+ 9	21 00	
Truk, Yap Is.	+10	22 00	
Ponape	+11	23 00	
CENTRAL AFRICAN REPUBLIC	+ 1	13 00	
CEYLON (Republic of Sri Lanka)	+ 5½	17 30	
CHAD	+ 1	13 00	
CHILE	− 4	08 00	(S) (+1 hr.) Oct. 13—Mar. 8
CHINA			
Zone 1 (Tihwa)	+ 6	18 00	
Zone 2 (Chung-King, Lanchow)	+ 7	19 00	
Zone 3 (Peking, Shanghai)	+ 8	20 00	
Zone 4 (Harbin)	+ 8½	20 30	
COCOS ISLANDS	+ 6½	18 30	
COLOMBIA	− 5	07 00	

INTERNATIONAL STANDARD TIME CHART (Continued)

COUNTRY	STANDARD TIME		Countries observing Daylight Saving Time during local Summer (S) or Winter (W) season and dates of observance if available.
	Hours fast or slow of GMT	Time at 1200 hrs. GMT	
COMORO ISLANDS	+ 3	15 00	
CONGO REPUBLIC	+ 1	13 00	
COOK ISLANDS	−10½	01 30	
COSTA RICA	− 6	06 00	
CUBA	− 5	07 00	(S) (+1 hr.) Mar. 30-Sep. 27
CYPRUS	+ 2	14 00	
CZECHOSLOVAKIA	+ 1	13 00	
DAHOMEY	+ 1	13 00	
DENMARK	+ 1	13 00	
DOHA, $	+ 3	15 00	
DOMINICAN REPUBLIC	− 5	07 00	(W) (+1 hr.) Jan. 21—
DUBAI	+ 4	16 00	
EASTER ISLANDS	− 7	05 00	(S) (+1 hr.) Oct. 13—Mar. 8
ECUADOR	− 5	07 00	
EGYPT	+ 2	14 00	(S) (+1 hr.) May 1-Sep. 30
EQUATORIAL GUINEA	+ 1	13 00	
ETHIOPIA	+ 3	15 00	
FIJI ISLANDS	+12	24 00	
FINLAND	+ 2	14 00	
FORMOSA	+ 8	20 00	
FRANCE (incl. Corsica)	+ 1	13 00	
FRENCH GUIANA	− 3	09 00	
FRENCH SOMALILAND	+ 3	15 00	

COUNTRY	STANDARD TIME		Countries observing Daylight Saving Time during local Summer (S) or Winter (W) season and dates of observance if available.
	Hours fast or slow of GMT	Time at 1200 hrs. GMT	
JAPAN	+ 9	21 00	
JORDAN	+ 2	14 00	(S) (+1 hr.) May 1-Sep. 30
KAMARAN ISLAND	+ 3	15 00	
KENYA	+ 3	15 00	
KHMER REPUBLIC	+ 7	19 00	
KOREA	+ 9	21 00	
KUWAIT	+ 3	15 00	
LAOS	+ 7	19 00	
LEBANON	+ 2	14 00	(S) (+1 hr.) May 1-Sep. 30
LIBERIA	GMT	12 00	
LIBYA	+ 2	14 00	
LUXEMBOURG	+ 1	13 00	
MADEIRA	GMT	12 00	
MALAGASY	+ 3	15 00	
MALAWI	+ 2	14 00	
MALAYSIA	+ 7½	19 30	
Borneo (except Indonesian Borneo)	+ 8	20 00	
MALI	GMT	12 00	
MALTA	+ 1	13 00	(S) (+1 hr.)
MARIANA ISLANDS	+10	22 00	
MARSHALL ISLANDS			
Majuro (same day as Guam)	+12	24 00	
Kwajalein (same day as Hawaii)	−12	24 00	
MAURITANIA	GMT	12 00	

GERMANY	+ 1	13 00	
GHANA	GMT	12 00	
GIBRALTAR	+ 1	13 00	
GILBERT and ELLICE ISLANDS	+12	24 00	
GREECE (and Crete)	+ 2	14 00	
GREENLAND, Scoresby Sound	− 2	10 00	
Angmagssalik and W. Coast	− 3	09 00	
Thule	− 4	08 00	
GUAM	+10	22 00	
GUATEMALA	− 6	06 00	
GUINEA, Republic of	GMT	12 00	
GUINEA-BISSAU	− 1	11 00	
GUYANA	− 3¾	08 15	
HAITI	− 5	07 00	
HONDURAS	− 6	06 00	
HONG KONG (and MACAO)	+ 8	20 00	(S) (+1 hr.) Apr. 20–Oct. 18
HUNGARY	+ 1	13 00	
ICELAND	GMT	12 00	
INDIA	+ 5½	17 30	
INDONESIA			
Western Time (Sumatra, Java, Madura, Bali, Bangka, Belitung, Lombok)	+ 7	19 00	
Central Time (Borneo, Celebes, Flores, Sumbawa, Sumba, Timor)	+ 8	20 00	
Eastern Time (Molucca Is., Tanimbar, Kai, West Irian)	+ 9	21 00	
IRAN (Persia)	+ 3½	15 30	
IRAQ	+ 3	15 00	
IRELAND, ●	GMT	12 00	(S) (+1 hr.) Mar. 16—Oct. 25
ISRAEL	+ 2	14 00	(S) (+1 hr.)
ITALY (incl. Sicily and Sardinia)	+ 1	13 00	(S) (+1 hr.) Jun. 1–Sep. 27
IVORY COAST	GMT	12 00	
JAMAICA	− 5	07 00	(S) (+1 hr.) Feb. 23–Oct. 25
MEXICO – Central Time	− 6	06 00	
Mountain Time	− 7	05 00	
Pacific Time, ∮	− 8	04 00	(S) (+1 hr.) Feb. 23—Oct. 25
MOROCCO	GMT	12 00	(S) (+1 hr.)
MOZAMBIQUE	+ 2	14 00	
NAURU ISLAND	+11½	23 30	
NEPAL	+ 5¾	17 30	
NETHERLANDS ANTILLES	− 4	08 00	
NETHERLANDS	+ 1	13 00	
NEW CALEDONIA	+11	23 00	
NEW GUINEA—Papua	+10	22 00	
West Irian	+ 9½	21 30	
NEW HEBRIDES	+11	23 00	
NEW ZEALAND	+12	24 00	(S) (+1 hr.) Nov. 3–Feb. 22
NICARAGUA, ●	− 6	06 00	
NIGER	+ 1	13 00	
NIGERIA	+ 1	13 00	
NORFOLK ISLAND	+11½	23 30	
NORWAY	+ 1	13 00	
NYASALAND	+ 2	14 00	
OKINAWA (Ryukyu Islands)	+ 9	21 00	
OMAN (Muscat)	+ 4	16 00	
PAKISTAN	+ 5	17 00	
PANAMA (Incl. Canal Zone)	− 5	07 00	
PAPUA NEW GUINEA	+10	22 00	
PARAGUAY	− 4	08 00	(S) (+1 hr.) Oct. 1—
PERU	− 5	07 00	
PHILIPPINE ISLANDS	+ 8	20 00	
POLAND	+ 1	13 00	
PORTUGAL	+ 1	13 00	
PORT. GUINEA See Guinea-Bissau			
PUERTO RICO	− 4	08 00	

INTERNATIONAL STANDARD TIME CHART (Continued)

COUNTRY	STANDARD TIME: Hours fast or slow of GMT	STANDARD TIME: Time at 1200 hrs. GMT	Countries observing Daylight Saving Time during local Summer (S) or Winter (W) season and dates of observance if available.
QATAR	+ 3	15 00	
REUNION	+ 5	17 00	
RHODESIA	+ 2	14 00	
ROUMANIA	+ 2	14 00	
RWANDA	+ 2	14 00	
SALVADOR, EL	− 6	06 00	
SAMOAN ISLANDS	−11	01 00	
SAO TOME ISLAND	GMT	12 00	
SAUDI ARABIA	+ 3	15 00	
SENEGAL	GMT	12 00	
SHARJAH	+ 4	16 00	
SIERRA LEONE	GMT	12 00	
SINGAPORE	+ 7½	19 30	
SOLOMON ISLANDS	+11	23 00	
SOMALI REPUBLIC	+ 3	15 00	
SOUTH AFRICA, Republic of	+ 2	14 00	
SOUTHERN YEMEN	+ 3	15 00	
SOUTH WEST AFRICA	+ 2	14 00	
SPAIN	+ 1	13 00	(S) (+1 hr.) Apr. 13-Oct. 4
SPANISH SAHARA	GMT	12 00	(S) (+1 hr.) Apr. 13-Oct. 4
SRI LANKA, Republic of	+ 5½	17 30	
SUDAN	+ 2	14 00	
SURINAM (Dutch Guiana)	− 3½	08 30	
SWEDEN	+ 1	13 00	

COUNTRY	STANDARD TIME: Hours fast or slow of GMT	STANDARD TIME: Time at 1200 hrs. GMT	Countries observing Daylight Saving Time during local Summer (S) or Winter (W) season and dates of observance if available.
U.S.A.—Eastern Time	− 5	07 00	(S) (+1 hr.) Feb. 23, 1975 through October 25, 1975
Central Time	− 6	06 00	(S) (+1 hr.)
Mountain Time	− 7	05 00	(S) (+1 hr.)
Pacific Time	− 8	04 00	(S) (+1 hr.)
ALASKA—Ketchikan to Skagway	− 8	04 00	(S) (+1 hr.)
Skagway to 141° long. W. (Yakutat)	− 9	03 00	(S) (+1 hr.)
141° long. W. to 162° long. W.	−10	02 00	(S) (+1 hr.)
162° long. W. to Western tip	−11	01 00	(S) (+1 hr.)
HAWAIIAN ISLANDS	−10	02 00	
U.S.S.R.—Moscow, Ukraine, West	+ 3	15 00	
Approximately every 15° from 30° 30' E.	+ 4	16 00	
to 172° 30' W. add 1 hr.	+12	24 00	
VENEZUELA	− 4	08 00	
VIETNAM (South)	+ 8	20 00	
WEST INDIES—Barbados, Guadeloupe, Leeward Islands, Martinique, Tobago, Trinidad, Windward Islands	− 4	08 00	
Aruba, Bonaire, Curacao	− 4	08 00	
Turks and Caicos Islands	− 5	07 00	
TAHITI	−10	02 00	
TAIWAN	+ 8	20 00	(S) (+1 hr.) Apr. 1—Sep. 30
TANGIER	GMT	12 00	
TANZANIA	+ 3	15 00	
THAILAND	+ 7	19 00	
TOGO	GMT	12 00	

UGANDA	+ 3	15 00	
UNITED KINGDOM ■	GMT	12 00	(S) (+1 hr.) Mar. 16–Oct. 25
UPPER VOLTA	GMT	12 00	
URUGUAY ‡	− 2	10 00	

TURKEY	+ 2	14 00	(S) (+1 hr.) Mar. 23–Nov. 1
YUGOSLAVIA	+ 1	13 00	
ZAIRE			
Kinshasa, Mbandaka	+ 1	13 00	
Orientale, Katanga, Kivu, Kasai	+ 2	14 00	
ZAMBIA	+ 2	14 00	

*—Local Clock Time varies each day according to Sunset. (May 1968 Dhahran adopted GMT + 3 as Standard Time).
■—Effective October 31, 1971 U.K. and Ireland reverted to GMT as Standard Time. ≠—Only Mexicali and Tijuana observe DST.
Ⅱ—Effective June 1, 1972 GMT + 3. $—Effective December 7, 1972. ‡—GMT—2 effective December 22, 1974.
♀—Arizona and parts of Idaho and Indiana do not observe DST. Michigan (except section in Central Time Zone) will revert to DST April 27.
♦—Queensland does not observe Daylight Saving Time. •—Effective February 16, 1975 Nicaragua reverted to GMT — 6.

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